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On the Sand Dunes
Etched by the Author

ETCHING

A PRACTICAL TREATISE

BY
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"THE VOICES OF THE DUNES AND OTHER ETCHINGS"

ILLUSTRATED BY THE AUTHOR

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INTRODUCTION

THIS book is intended for the student. It is designed to adapt and condense methodically the most reliable information and data now available on the subject of etching, as a means of line expression, for the benefit of the practical worker.

To this have been added observations and other matter suggested by twenty-five years of practical experience.

The bibliography of etching has become so extensive, so complex, and in a measure so confusing to the ordinary student and amateur that the beginner is often at a loss to know upon what authority to rely. Some of the most important works on the subject are not only out of print, and difficult to obtain, but are quite elaborate and expensive, and contain much matter that is really beyond the scope of a strictly practical treatise. A book of this character, therefore, would seem to have a distinct field.

It would be impossible to cover the entire subject of pictorial expression by intaglio processes in a small volume intended for use as a manual, and no one writer could have the practical experience necessary to enable

him to do adequate justice, from a technical standpoint, to all of the various methods used. It has been thought best to restrict this work to the consideration of original expression in line on the plate by means of acid, and drypoint, which is practically inseparable from it.

Mezzotint, aquatint, and other kindred processes, as well as photo-mechanical methods of etching, have been left to specialists on those subjects.

It is not the purpose of this treatise to combat opinion, to go extensively into the theoretical side of the subject, nor to enumerate the various influences which have placed etching in the exalted position it now occupies. Many of the great masters have turned to it for expression. It is not intended to discuss what they have expressed, or their particular modes of expression. This field is amply covered.

It is the mechanical means and the craftsmanship necessary to the successful practice of the art, that the following pages are intended to simplify and elucidate. Technical terms have generally been avoided, existing authorities have been freely consulted, and an effort made to provide the student with a concise, reliable manual, as complete and compact within its own limits as possible.

Etching is peculiarly an art for the enthusiast and the poet. The wonderful eloquence of its black line, the brilliancy and mystery attainable through it, its

wide latitude of expression and interpretative power, commend it as one of the noblest of the graphic arts.

The sorcery of the bitten line has a charm which is all its own. This charm cannot be described, and is known only to those who are under its spell. A subtle witchery begins to brood over the plate when the bubbles of the acid appear on its face, and a thrill of anticipation comes when it is placed under the felt blankets, ready for the first impression.

Mere facts are the most unpoetic things in the world, and to the cold and calculating realist, accomplished draughtsman though he be, this art will not appeal. It is essentially a vehicle of emotion and artistic thought.

To one who learns the song of the line upon a copper plate, a new world is opened. It is into this enchanted land that we now seek a path.

E. H. R.

CHICAGO, June 1914.

CONTENTS

CHAPTER	PAGE
INTRODUCTION	iii
I. THE FIRST EXPERIMENT	I
II. EQUIPMENT	6
III. METHOD	62
IV. CORRECTIONS AND ADDITIONS	100
V. { DRYPOINT	114
{ SOFT-GROUND ETCHING	118
VI. PRINTING	125
CONCLUSION	145

ILLUSTRATIONS

	PAGE
ON THE SAND DUNES	<i>Frontispiece</i>
Etched by the Author.	
ETCHING TOOLS AND MATERIAL	41
ETCHING TOOLS	47
PLATE ETCHED BY DIFFERENT METHODS	74
Etched by the Author.	
STUDY OF WILLOWS	96
Etched by the Author.	
NATURAL AND ARTIFICIAL PRINTING	136
From Etchings by the Author.	

Etching: A Practical Treatise

CHAPTER I

THE FIRST EXPERIMENT

WE will tell the "story" of an etching, and conduct the first experiment, for the purpose of giving the reader a clear general idea of the process, before entering into details. The various steps necessary will be briefly summarized, using one method, for the purpose of illustration. This synopsis will aid in keeping the sequence of the several operations in mind through the pages that follow.

As you proceed, refer to the descriptions of the materials mentioned, and directions for their use, under the various heads, in other parts of the treatise, and with a little care you will probably get along very well with your first venture.

First clean the polished copper plate thoroughly with a rag and turpentine, and afterwards with whiting—all traces of which must be removed—without touching the surface with your fingers.

Clamp it into a hand-vise, by one corner, and heat it, face upward, over a gas flame. Do not get it too hot, or the ground will boil or be burnt when it is put on.

It is now ready for the application of the etching ground, a ball of which is rubbed gently over the surface. The heat causes the ground to melt and flow through its silk covering.

While the plate is still hot use a dabber to take off the excess ground and evenly dispose over the surface the thin film which is to protect the plate from the action of the acid later on. When this protective medium has been properly applied, it uniformly covers the plate so thinly that the lustre of the copper is visible through it.

The plate is then smoked, by putting it again into the hand-vise, and passing it rapidly back and forth through the flame of a gas jet or candle, many times, until the whole surface is thoroughly and evenly blackened.

The subject is then drawn on the plate with the etching point. Wherever the black protective film is touched by the point, the bright copper appears.

When the drawing is completed, the back and edges of the plate are varnished, so that no portion of it can be attacked by the acid, except where the lines have been drawn.

The plate is then ready for the acid bath which, in this case, consists of one third chemically pure nitric

acid and two thirds water, in an acid-proof tray. After the plate has remained in the bath a few moments, small bubbles begin to appear on the lines, indicating that the action of the acid has commenced. These bubbles will soon thickly cover all the lines, and must be delicately brushed away every minute or so, with a feather or long-haired fine brush.

When the plate has been in the acid for perhaps two or three minutes, the lines which are to appear the lightest in the proof have been sufficiently bitten. The plate is removed from the bath, washed in water to remove all of the acid from the lines, and dried gently with a blotter.

The lines which have been sufficiently bitten are then carefully covered with stopping-out varnish, to protect them from further corrosion. When the varnish is dry, the plate is re-immersed, and the action of the acid allowed to continue. In a few minutes there are more lines which are as deep as you want them to be, and these are varnished over as before.

During all this time the acid has been at work on the lines which are to be the deepest and heaviest in the final proof. To carry these to the desired depth, the acid is permitted to work possibly fifteen or twenty times as long as for the lightest lines, which were stopped out at the beginning.

Many accidents, both happy and unhappy, are likely to occur during the biting, but we will suppose

that all has gone well up to this point. If we have met with disaster, the problems of correction can be taken up when the ground has been removed.

We now take the plate from the tray, wash and dry it, clean it with kerosene, and we have our polished copper plate, as before, except that we have our drawing on it, sunk in lines of various depths below its surface.

The plate is now ready for a trial proof. After warming it, the surface is covered with ink with a roller, care being taken that all of the lines are filled with it. The greater portion of the ink is then wiped away with a rag. As the plate cools, and the bright copper begins to appear, we proceed more carefully with the wiping, so as not to remove any of the ink from the lines. With a cleaner and stiffer rag, practically all of the ink is wiped from the surface, leaving the lines filled with it. As this is only a trial proof, which is to show the exact state of the lines, charge the side of the palm of your hand lightly with whiting, and go over the surface swiftly, so as to leave no tint upon it.

Again warm the plate and lay it face upward on the bed of the press. The paper, having been previously dampened, is laid over it. Put a clean white blotter over the paper, and after it one or two felt press blankets and a rather heavy stiff blanket. The handles of the press are then turned and the plate passes under the iron roller. After the pressure has been applied, lift

off the blankets, take hold of a corner of the paper, and slowly peel it from the plate. The blotter will have taken up the moisture expelled from the paper by the pressure of the roller, which it is not desirable to have in the blankets. The heavy pressure has moulded the soft damp paper into every line on the plate, and we have a reproduction of the drawing embossed in black ink.

Had we not inked the plate before it went under the roller, we would have simply obtained a paper model, in relief, of the lines in intaglio on its surface.

This all appears very simple. We have not, however, learned exactly how to take the successive steps, or how to combat the difficulties and discouragements which beset the inexperienced worker at almost every stage.

A knowledge of the numerous variations in the operations mentioned, the many corrective methods, and other resources, is still to be acquired. Both benign and malignant fairies have lurked among the bubbles of the acid. We have undoubtedly made several miscalculations, and our faltering steps have probably found some unexpected pitfalls on the way. To enable us to avoid these as much as possible in the future, we will now go into the subject more extensively and describe the various materials, and the methods of using them, in detail.

CHAPTER II

EQUIPMENT

The plate.—Before we commence we must acquire the necessary materials and see that the studio is conveniently arranged for the work before us.

Naturally the plate requires our first consideration, for its shining surface is to be the field of our coming struggles, and on it we are to meet victory or defeat. Every other material and every tool used in the process will be subsidiary to it. Artistic fame may be hidden among the metallic atoms composing it, and it is possible that your needle and acid may some day set it free.

The plate may be either of copper or zinc. Copper however is generally preferred. Its great ductility, tenacity, and hardness adapt it exactly to our purpose. All etchers agree that it is the only metal to which no objection can be offered. Years ago, when most of the authoritative treatises were written, it was considered essential that the plate be thoroughly hammered before it was used, to increase its density and to get rid of possible soft spots in it.

The hand-hammered plates can be especially ordered

if desired. They are much more expensive and, at least for ordinary work, will not be needed.

The consumption of copper plates in the commercial arts has become enormous. The demands of the half-tone engravers, and other process workers, upon the manufacturers have resulted in excellent products. The ordinary commercial plates now on the market are cold rolled under powerful pressure and are usually of quite uniform hardness.

You can easily test the density of your plates by a few scratches with a steel point on the back. Another way is to balance the plate with your finger on the back, in its centre, and strike it lightly with a long pencil, as you would the edge of a bell. A hard plate will ring with a clearer and higher note than a soft one. You can also test your copper by clamping the end of a strip of it into a vise and bending it to a sharp right angle. A piece of soft copper will show no fracture at the point of the angle. If the density is about as it should be, little fractures will be visible all along the edge where the strain occurred. Considerable experience and familiarity with the properties of the metal are of course necessary to make these tests of value.

As for possible soft spots, I have never found them in the plates now on the market, and have never detected any unequal effects of the acid from this cause.

Any half-tone engraver will tell you where to obtain

your plates and will probably supply you with them if you ask him to do so.

There are two thicknesses in common use, sixteen and eighteen gauge. The latter is preferable in the ordinary sizes. It is lighter to handle and cheaper. Should you desire to use a very large plate—say larger than 10 x 14 inches—the heavier grade would be better.

Eighteen gauge copper plates cost about three quarters of a cent per square inch, but the price varies from time to time, and with different dealers.

The plates used by card engravers are usually copper with an alloy of tin. There is no serious objection to them, and if it is more convenient to procure these plates, you may use them, at least to begin with. They are a little more expensive than pure copper, but usually a card engraver is accessible who will furnish them. He is likely to have only small sizes on hand but these will be sufficient for your preliminary efforts.

Zinc plates cost less than half as much as copper, and have some other advantages. The writers of existing treatises do not seem to have done full justice to the zinc plate. Few of them appear to have much use for it. Zinc is softer and more porous than copper, but it has a decided character of its own under the influence of the acid. Rich "fat" lines of peculiar quality and charm are obtainable on it and extremely delicate lines are possible by the use of highly diluted mordants. It

is the general impression that zinc will not yield as many proofs as copper, but it wears wonderfully well.

Mr. Chattock, in his treatise published in 1883, claimed that zinc would yield a greater number of proofs than unprotected copper before showing signs of wear. I am not prepared to endorse this statement, but I maintain that the zinc plate is invaluable in the hands of one who appreciates its possibilities and understands its limitations, although its reputation is somewhat smirched by adverse testimony.

Mr. Brangwyn has certainly demonstrated its capabilities in recent years, and his followers are devoted to its use.

Zinc is very liable to rust, but proper care, such as all plates of value should receive, will prevent this.

Steel plates are not practicable for ordinary work. Their extreme hardness prevents the manipulative work which is almost invariably necessary after the first proof, and this lack of plastic quality bars them from consideration for our purpose.

A copper plate can be steel faced and its life thereby prolonged indefinitely. A thin film of iron is electrically deposited on its surface. This coating is so minute that, in theory, the printing qualities of the plate are not interfered with, but extremely delicate lines unquestionably suffer. A proof from a plate after it has been steel faced appears to be lacking in sympathetic quality when compared to one pulled from the bare copper.

Naturally an impression made before steel facing is much more highly valued.

Zinc plates must be copper plated before they can be steel faced and the deterioration in such a case is more pronounced.

There is practically no limit to the life of steel-faced plates, as they can be re-steeled when the first coating begins to wear through.

It is convenient to have your plates cut in sizes corresponding to the standard photographic dry plates in the market. These sizes are $3\frac{1}{4} \times 4\frac{1}{4}$, 4×5 , $3\frac{1}{2} \times 5\frac{1}{2}$, 5×7 , $6\frac{1}{2} \times 8\frac{1}{2}$, 8×10 , and larger. You can procure photographic plate-holders with stiff slides and keep grounded plates in them when they are not being worked on. The slide prevents accidents to the ground, a contingency to which it is always exposed when the plate is left lying about. The holder also makes a perfect carrying case. Another convenient way of protecting the grounded plates when you have occasion to carry them is to put a small ball of etching ground on each corner, and wrap two plates face to face.

The arbitrary photographic sizes suggested need not interfere with the rectangle used in your composition as the plate can be easily cut to any smaller size and shape later.

In ordering your plates, have the edges bevelled to an angle of about 45 degrees, and have the corners slightly rounded, at least enough to take off the sharp

points. It makes them much easier to handle, and this would have to be done anyway before beginning your work at the press.

Keep the new plates carefully wrapped up and do not expose them to scratches or finger marks until you are ready to use them. The surfaces will oxidize if left exposed to the air for any great length of time.

Etched plates, which you consider of value, should always be grounded when they are put away, to protect them from oxidization, and kept in strong manilla envelopes or wrappers to protect them from other injury.

The etching ground.—Primarily, the ground constitutes the defence of the plate against undirected corrosion by the acid.

The composition of this protective agent has been the subject of careful consideration and experiment by numerous practical workers for over three centuries, but the pre-eminence of the invaluable formula of Abraham Bosse (1602–1676) has never been seriously disturbed. His treatise, published in 1645, was the first work on etching as a means of pictorial expression. Several modifications of his ground have proved excellent, but no perfectly satisfactory substitute has ever been found, and no important changes in it have come into general use.

I have tested many modifications, including those

in the following table, with more or less successful results, but the most fortunate combinations of the ingredients differed so slightly from those given that it is unnecessary to describe them.

COMPARATIVE TABLE

(Parts by weight)

	White wax	Asphaltum	Gum mastic	Burgundy pitch
Abraham Bosse	5	1½	3	
Rembrandt (?)	2	1	1	
Peter Moran	1½	2		1
Modification (1)	1½	3		2
" (2)	2½	1	1	1
" (3)	2	5		

The harder grounds, those containing a smaller proportion of wax, are used by some etchers for biting with nitric acid, their experience having suggested more resistance to that corrosive agent than is necessary with the still mordants, particularly in warm weather.

Any of the ingredients given will protect copper from acid. However, a proper balance of them is necessary to facilitate the work of the needle.

The plastic medium is the wax; the asphaltum is added to give strength and adhesive quality to the ground; and the gum mastic hardens it. Burgundy pitch gives further adhesiveness, but an excess of it causes an unpleasant stickiness. Used alone, wax would be too soft while asphaltum and gum mastic would chip off under the needle. The pitch would clog the

point and be quite unmanageable. Asphaltum, however, can be successfully worked on if it is not fully dry. The practicable stage is easily found by trial with the point.

It is advisable to make your own ground. You can make up a pound or two, enough to last for years, in a short time and it is really little trouble to do it. You can never be sure of the composition of the grounds sold by dealers. They are generally good, but more expensive.

A druggist will supply the materials and weigh them out in the proper quantities if it is not convenient to do it yourself. Be particular to see that you get them from a reliable dealer. They must be pure and of the first quality.

Use a glazed earthenware or iron kettle of at least twice the capacity of the amount of ground you intend to make. Put it over a slow fire and melt the wax first. A gas stove, Bunsen burner, or some other source of heat which can be regulated, is essential. Add the gum mastic and stir slowly with a glass rod until it is thoroughly melted and appears to be completely dissolved in the wax. If you are using Burgundy pitch, add it and continue stirring for some time before putting in the asphaltum. Add this gradually. It may now be necessary to increase the heat but be careful in doing this. Do not let the ground boil as you are likely to burn it. It will take some time for the asphaltum to

assimilate with the other ingredients. It will remain at the bottom of the kettle, in a heavy sticky mass, for a long time if left alone. Get this mass on the end of the glass rod and stir the mixture with it until no lumps remain. Maintain the heat for two or three hours after all of the ingredients are completely melted, stirring occasionally. Be cautious with your fire as the compound in the kettle is very inflammable. The mixture should now be as homogeneous as it is possible to get it in the kettle.

Pour the hot ground into a pail of tepid water. In a few minutes you can gently mould the mass together with your hands, and begin to knead it carefully under the water so as to get it to a moderately uniform temperature. Be careful to avoid burning your fingers in doing this, as there is a lot of melted ground inside the mass which has not yet come into contact with the water. As soon as it is safe to do so, take the ground, while it is still soft, out of the water, and pull it for a few minutes, as you would molasses candy. It will be of about the same consistency.

The object of this manipulation of the cooling mass is to get rid of all of the water, and to obtain greater homogeneity. When the ground begins to get too hard to pull, begin taking off chunks of it, and mould them into balls or elongated lumps of convenient size, weighing about three ounces. When these are hard wrap them in fine strong silk. Pull it tightly over the ball

and gather it firmly at one end. Wind a string around the gathering several times and tie it securely. Then trim off the surplus silk in such a way as to leave a convenient handle for the ball.

This cover will act as a strainer, preventing any particles of foreign matter, or small lumps, which the finished ground may accidentally contain, from eventually reaching the plate. It also protects the ball from contact with other substances from the outside. The ground melts and flows through the meshes of the silk when applied to the hot plate in the process of grounding.

You need not wrap up all of the ground, as you may need some of it to make soft or liquid ground later.

Put all of the balls into a glass jar with a screw top, for protection from dust; label the jar with the formula you have used.

In cleaning up you will find kerosene the most convenient solvent.

Soft ground.—This is used in the soft-ground process which will be described later. It is usually composed of equal parts, by weight, of pure mutton tallow and Bosse's ground.

Melt the ground slowly, add the tallow, and stir thoroughly for at least half an hour. Cool and manipulate the mass, as you did the ordinary ground. Wrap it in silk of a different colour from the other balls to

distinguish it. It is better to put a small tag on it if there is danger of getting it confused with the other ground, but a slight pressure with the finger nail will always identify it.

Liquid ground.—Some etchers prefer to apply the ground to the plate in liquid form. It is, however, comparatively expensive. It does not appear to possess any particular advantages, after it has been applied, and it seems useless to complicate our methods any more than necessary. For the benefit of those who may wish to use it this formula is given.

Break up an ounce of Bosse's or Rembrandt's ground into an eight-ounce bottle and fill it with chloroform. Let it remain a day or two, shaking it occasionally, and filter it through some pieces of fine linen or cotton cloth, in the bottom of a funnel, into another bottle, which must be kept securely corked when not in use.

More chloroform can be added when greater fluidity is required, which will be quite often.

These directions for making and caring for etching ground may appear, in some particulars, unnecessarily minute, but, next to the plate, the ground is your most important material. Proper care devoted to it will save many vexations and costly failures. Dust is its greatest enemy, and every precaution must be taken against it. The acid will find all the specks for you

with deadly accuracy, when the plate gets into the bath.

Stopping-out varnish. There are several formulas for this indispensable medium. The simplest and most convenient varnish, and the one which, after years of experience, you will probably find yourself using, is composed of asphaltum and turpentine. You can procure it of any dealer in paints and varnishes. If it is too thick to work smoothly you can add a little turpentine.

If necessary you can make it yourself. Put four ounces of asphaltum into a wide-mouthed bottle and add eight ounces of turpentine. Put the bottle on a steam coil, register, in the sun, or in any convenient place where it will be subjected to a gentle heat for several days. Stir it occasionally with a glass rod. It will be ready for use when the lumps are all gone and it works smoothly with the brush.

This is the stock varnish of the studio and it answers almost every purpose for which you need varnish.

Additions of other materials can be made to it if required for special purposes. For instance if you wish to stop out intricate passages in your plate, you can add a little lampblack to prevent it from running in the lines when you have made it thinner than usual by the addition of more turpentine.

The strong, penetrating odour of spirits of turpentine

is very objectionable in the studio, or anywhere else for that matter, so use the ordinary turpentine, which answers just as well. It is usually advisable to filter it before using.

The small glazed earthenware saucers, about three inches in diameter, used by draughtsmen, made so that the bottom of one fits over the top of another, are very convenient. They are called cabinet nests. You can fill one of them with the varnish and let it dry for several days so as to form a solid cake in the saucer. When you desire to stop out small spots or passages on the plate which you wish to dry quickly, you can pour a little chloroform on the cake, work it up with a water-colour brush to the desired consistency, and use it as you would colour. The chloroform is very volatile and dries quickly. A small homœopathic phial of it, kept corked when not in actual use, will be convenient to dip your brush into when required, and to clean it when you are through. You will soon become accustomed to using the varnish in this way. It is very simple and practical. If you are not in any special hurry it is better to use turpentine than chloroform.

When you are done with the asphaltum cake fit another saucer over the top and put it away so that our vigilant enemy, the dust, cannot get to it.

In using the brush charged with thin varnish you must make the application to the smoked ground on the plate cleanly and lightly so as not to disturb the surface.

Do not make the second stroke until the varnish laid by the first one has partially dried or you will make an unpleasant spot to handle. A little practice with the brush will enable you to see and avoid this minor difficulty.

Should you prefer to use a varnish which, when dry, is not quite so hard as the one described, you can prepare it as follows.

Make up a bottle of liquid ground (one ounce Bosse's ground to seven ounces of chloroform) and when it is thoroughly dissolved, add about one sixth of its bulk of your asphaltum-turpentine varnish.

This varnish dries quickly and can be worked on with the point more easily after it is dry.

It should be well stirred, left for a day or two, and then stirred again before using. Keep the bottle tightly corked or the chloroform will disappear.

Be careful when you buy asphaltum, to see that it is clean and free from loose foreign matter. If it appears dirty, wash and dry it before using.

An excellent quick-drying stopping-out varnish can be made by dissolving shellac in alcohol. It should be a little thinner than honey when applied. It is useful on small surfaces and often saves much valuable time.

Mordants.—The acid is a splendid servant but a merciless master. It savagely follows the direction of

the least resistance. Its activity is regulated by elements combined with it which facilitate and control its work on the metal.

We will consider only three mordants, as they completely meet every requirement.

The Dutch mordant consists of:

Hydrochloric acid, C.P.	5 ounces
Chlorate of potash	1 ounce
Water	44 ounces

Use a half-gallon bottle with a glass stopper. Put in the water and chlorate of potash and wait until you are sure that all of the crystals are dissolved. Then add the acid and mix the solution by tipping the bottle over and back a few times. Drop a small piece of copper about half the size of a penny into the bottle. After a few hours the mordant can be used. The reason for adding the copper is that fresh Dutch mordant does not always attack the copper as readily as that which already contains a little copper. Many apparently unaccountable disappointments occur from this cause. The addition of a little old mordant will serve the same purpose.

This mordant is non-ebullient on copper, but ebullient on zinc.

If you wish to use Dutch mordant on zinc you should dilute it with about five times its bulk of water.

The nitric mordant is usually composed of:

$\frac{1}{3}$ Nitric acid C.P.

$\frac{2}{3}$ Water

This can also be made up and kept in a glass-stoppered bottle. The water should be put into the bottle first and the acid added. *Do not pour water into pure acid.* Some experienced etchers prefer nitrous acid instead of the nitric C.P. It works satisfactorily, but it is a vile substance to handle, and its fumes are satanic.

You can dilute this mordant still more to meet the requirements of close delicate work with the point.

For biting ordinary lines on zinc it should be diluted to at least one part acid to ten of water, but for heavy isolated lines you can use it stronger.

The nitric mordant is ebullient and it is a joy to see it work. There is no witchery or romance in the cold, still action of the other mordants. Much of the fascination which clings to the art of etching comes from these little green bubbles. The lines seem to vibrate with tremulous life and to become moving and sentient things under the magic of a wand above them. We sometimes feel the same mysterious thrill in looking out over a vast expanse of still water whose surface begins to be fretted by little puffs of the coming wind. But this is a practical treatise and we must not let our imagination wander. Our fancy must be reserved for the expression we hope to find for it in the eloquent

black line toward which we are striving. Its mastery is our goal.

Perchloride of iron (or ferric chloride) is used by the half-tone and photo-engravers in large quantities. It is put up in sixteen-ounce bottles by the manufacturing chemists. You can get it from the druggist. It is used undiluted on copper.

This mordant seems to have received scant consideration from the various writers who have mentioned it. It is particularly valuable for closely needled work which is to be very lightly bitten, such as skies, and delicate passages in figure and portrait work. It works rapidly and evenly and makes a beautiful line which it does not widen perceptibly.

One objection to it is that its opaque colour prevents observation of the plate in the bath. It is not as good for very deep lines as the other mordants, as a sediment forms in the bottom of the line after a little depth has been attained, which retards the action of the acid. The half-tone engravers avoid this by immersing their plates face down in the acid, secured by grooved wood blocks at the edges to prevent contact with the tank. The sediment then falls to the bottom.

Another difficulty in using perchloride of iron is that it deeply stains everything it touches. If you are an enthusiast you will not mind this, but others will.

The needle.—The word needle is a generic term, used to designate any kind of a point employed in making the drawing on the grounded plate.

Your point is to be the weapon of your fancy, and it is essential to have it suit you in every way. After several years you will probably discover a lingering affection for some disreputable-looking tool with delightful associations, which you would rather work with than anything else, and without which you would feel lost. If you love your art you will love its tools and materials.

Any pointed instrument, which can be conveniently held in the fingers like a lead pencil, will do the work if it is properly sharpened. It must not scratch the plate. Its function is simply to remove the ground cleanly and completely from the surface wherever it touches it.

It is well to accustom yourself to the use of a point about the weight and size of a lead pencil, as you are in the habit of exerting a slight pressure in ordinary drawing and writing. The light point will therefore feel more natural.

A heavy point applies the pressure to the ground with its own weight and many etchers prefer it, feeling that it gives a greater freedom of movement. This is, however, purely a matter of individual taste and preference.

You can take a common brass porte-crayon, such as

is used to hold short ends of charcoal in drawing. Carefully trim down a small cork to about the diameter of a lead pencil, and about half an inch long. Use a very sharp knife or a razor (not your own) for this purpose, or the cork will crumble. Through the length of this push a large brass bank pin, which is about twice the size of a common pin, and fasten the cork into the end of the porte-crayon by pushing the small brass ring firmly up over it. Then fasten another piece of cork in the other end with a smaller pin or sewing needle in it, so that you will be provided with at least two points of different fineness. The pins are susceptible of delicate, clean working points, which are much softer than steel and not so likely to scratch.

Instead of cork you may use a piece of hard rubber, like the eraser in the end of a new pencil. Twist it out of the metal band and it is ready for use.

It is well to have several of these devices, with points of varying fineness. They possess important advantages. When you are through working with them the rings can be loosened, the points pushed back into the frame and firmly secured so that they will not be exposed. This will protect them from injury and will protect you from accident should you wish to carry them in your pocket.

Never put sharp, unprotected etching points in your pocket.

An orange stick, such as is used by manicures, is

convenient for heavy lines. These sticks are also made of ebony and bone, which are harder than the orange wood. They can be sharpened with a fine file to a surprisingly small point which wears well and does not make lines on the bare metal.

A "6H" lead pencil can also be used in the same way, but if sharpened to an extremely fine point it will of course be likely to break.

If a heavy point is desired you can procure from your dentist some of the straight steel tools, with tapering ends, which have become damaged or broken in the practice of his cruel profession. Get the thicker ones, about the size of a pencil. Some of them have hexagonal vulcanized rubber handles which are pleasant to hold. Those, however, which we will need for drypoints will have to be all steel, as it may be necessary to temper them, and the vulcanized rubber would not stand the heat. These discarded instruments can be ground on an emery wheel to any desired shape. Several kinds of cheap water motors, attachable to a faucet and fitted with all kinds of grinding and polishing wheels, are on the market. If electricity is available, a small motor can be procured at moderate cost. The emery wheel, which should be at least four inches in diameter, will be of constant utility. It will save an immense amount of labour and time. After grinding the points, you will need to finish them on an oilstone.

A little experience will indicate just how the points

can be finished so that they will not mar the copper, even if they be very fine. If a point scratches, move it around on the oilstone lightly, holding it almost upright, turning it continually, until the scratchy quality disappears.

There will be variations in the methods of using the needle, but we are concerned now with a point that will make a line as fine as we want it, and not attack the metal. If you should wish to clean off the ground and redraw the subject, which will often happen, it will be inconvenient to have traces of former work on the plate.

Steel etching needles are sold at the artists' material stores. They are about three eighths of an inch thick at the centre, tapering to a point at each end, and are about seven inches long. They are quite satisfactory. You can also obtain small steel points set in wooden handles, which answer just as well.

Drypoints.—For drypoint work you will require the finest points obtainable; also some of medium strength, and at least one very strong one. There should be two kinds, round and flat. The flat points, sharpened on each side, should have slightly convex, keen cutting edges, with rounded corners. Under a magnifying glass, the edges would resemble those of miniature axe blades. One of the round points should have a rather long, slender springing point, which you will sometimes use in particular kinds of work.

The dental instruments, before referred to, are well adapted to drypoint purposes. Grind a number of them on the emery wheel, and finish them with the oilstone. They must be very sharp, so as to cut easily and deeply into the copper with moderate pressure. The advantage of having several sharp points at hand is obvious. A dull point is very exasperating, and is more so when it is necessary to stop work on a plate and sharpen it.

See that the points have the requisite temper. If they are too soft they will dull easily. If you wish to temper a point, polish it until it is very bright for at least an inch from the sharp end, clamp it into a hand-vise, and heat it in a gas flame until the first half inch, or more, is cherry red. Then dip just the end of the point—not more than an eighth of an inch of it—quickly into cold water. Withdraw it instantly; hold the hot tool in a good light, and among the other tints, you will see a band of delicate straw colour creeping down toward the end, on the polished surface of the steel. The moment that this colour reaches the sharp point, plunge the tool into the cold water, and allow it to cool entirely. If the heating and cooling are properly done, the steel will be hardened to the desired degree.

A diamond point is quite expensive, costing from \$10 to \$20. It can be purchased from the engravers' supply houses. The diamond does not get dull, and

cuts a beautiful, clean, uniform line. It is likely to break if extreme pressure is applied for very deep lines. Steel is better for them. There is little danger of breaking the diamond, however, with ordinary use. It raises less burr than steel, and often takes a small thread of metal entirely out of the line.

In selecting a diamond, do not get a long thin one. Those which are comparatively short, about an eighth of an inch in length, with a good working corner, are quite as effective, and safer. Take a small piece of copper with you and try several until you find one that suits you. No two are exactly alike. When you have acquired your point, put an easily recognized mark on the holder, where your thumb naturally rests in holding it in the most advantageous position. This will obviate the necessity of turning it a number of times when you pick it up to find the exact point at which it will cut. It is possible to obtain one which will work almost equally from any side, but these are rare.

If you should happen to chip off a small fragment, and you cannot find another spot that will cut satisfactorily, a diamond cutter will probably be able to fix it up without serious expense.

You will not need a diamond to begin with, and you can get along without it entirely. It is however a delightful luxury, and is well worth its price if you do much drypoint work.

Studio supplies.—One of the most annoying obstacles encountered by the beginner is a lack of knowledge where or how to obtain the materials required.

Many addresses of dealers could be given, but as some of them, at least, would probably become obsolete in a short time, it seems better to indicate generally, as nearly as possible, the kinds of dealers to consult. Many of the articles are kept in stock at the artists' material stores, or can be procured through them, but you will have to depend on other sources for some of them. Others you can make yourself.

The following list may seem somewhat extended, but it is important to have what you need when you want it, and great care should be exercised in fitting up your studio in such a way that you will not be subjected to annoyances at times when you are least prepared to endure them.

The illustrations will enable you to identify some of the articles, and will indicate what they should look like when you get them.

In addition to what has already been mentioned, you will need the following supplies.

Dabbers.—To make one of these take a circular piece of strong pasteboard about four inches in diameter, wad up a handful of well separated horsehair in a piece of woollen cloth, and shape it evenly against one side of the disk. Over this stretch a piece of taffeta silk large

enough to permit of an adequate gathering on the other side of the pasteboard. Draw it tightly together from all directions, at the same time shaping the mass of horsehair with your fingers, until it is quite firm and of equal density. Then wind a strong string tightly around the gathering, tie it securely, and trim the loose silk of the gathering so as to leave a convenient handle, as you did in covering the ball of etching ground. The dabber, when finished, should have a fairly firm springing quality. The cover can be renewed when necessary. Be careful to pull out any hairs that may protrude through the silk, with a pair of tweezers, as they would be likely to cause annoyance in grounding the plate. A dabber can also be made of fine soft leather, obtainable at a leather store, or old kid gloves can be utilized. When leather is used, the cloth lining is unnecessary. If you use a dabber for applying ink to the plate, in printing, it should be of leather. It must be kept separate from the others, and used for ink exclusively. The dabbers should be cleaned with turpentine after use, and kept in a covered box to protect them from dust.

Rollers.—Two will be required, one for grounding plates, and the other for ink. Both can be of rubber, about two inches wide, and an inch and a half in diameter. They should be perfectly round, have uniform surfaces, and be provided with legs, so that the rubber will not touch anything else when they are reversed

and laid down after use. Carefully clean them with turpentine, after using, and put them in a dust-proof box. The resiliency of the rubber is an important factor. If it becomes hard, get a new roller, or have the hard surface removed. The cylinder can be taken from its frame and placed in a lathe. With a sharp chisel, or emery paper held over a straight edge, so that the rubber will be attacked uniformly, a new surface can be obtained. Reduction of the roller is of value only when the hardening does not extend much below its surface. A good roller costs from one to two dollars. The cheap ones, consisting of a piece of hose stretched over a wooden cylinder, are practically worthless.

Leather rollers are also sold, which are preferred by many for laying ground.

Hand-vise.—You will find the hand-vise at the hardware store. It should have a wooden handle, and be at least seven or eight inches long. Pieces of soft leather can be cemented on the inside surfaces of the jaws to protect the plate from abrasion when it is clamped into the vise. It is used for the purpose of providing a handle for the hot plate. It is best described by the illustration. Get a good one.

You should also have a larger vise attached to a strong table or bench, for which you will find a variety of uses. The plates can be clamped into it when it is

necessary to bevel them with a file or cut them with a metal saw.

Files.—Get one heavy flat file which will cut rather coarsely and rapidly, and one with a finer surface for use when you are nearing the completion of your filing. A small fine file is then desirable for finishing.

Anvil.—This should be about two and a half inches square and about an inch thick, of good steel, with a highly polished top. It will be used in connection with a small hammer and nail punch to restore spots on the surface of the plate to the proper level, after work on them with the scraper.

Metal saw.—Get one with an adjustable back, that will permit of the use of blades of different length, up to ten inches. It will be used to cut your plates when necessary.

Oil- and whetstones.—The large oilstones used by carpenters, mounted in wood with a cover, are very useful for rather coarse work, but you will need a fine hard oilstone for your points and scraper. Keep the surfaces clean with an old toothbrush and kerosene.

Callipers.—Get a pair with rather fine points. They should be long enough to reach the centre of any sized

plate you are likely to use. They will be used to locate points on the back of the plate corresponding to those on the front.

Photographic plate-holders.—These come in the standard sizes heretofore mentioned. They should have hard paper or wooden slides instead of vulcanized rubber.

Drawing-boards.—Several will be required. They should be of light wood, about 12 x 17 inches, about half an inch thick, and made of three-ply laminated stock to prevent warping. They should be perfectly plain, without cross-pieces on the ends which add any thickness. The plate can be fastened to the board by means of heavy thumb-tacks pushed in against the edges, the tops extending over on to the plate. The boards will also be used in connection with large blotters in pressing and drying paper and proofs. An excellent board to work on has an iron fixture attached to the back by means of which it is clamped to the edge of the table. It is adjustable to any position or angle. Rigidity is provided for by thumb-screws. The contrivance costs about \$3.

Trays.—The most practical trays are of white enamelled ware. They should be shallow and have a lip at one corner to allow the contents to be poured into a

bottle. **Keep them perfectly clean.** Do not use trays made of fragile ware, for when they break it is usually at the wrong time.

Brushes.—A flat strong brush about half an inch wide is convenient for ordinary use, but for work on the lines with stopping-out varnish you will need several water-colour brushes of different sizes.

Feathers.—The long feathers from the wing of a chicken will be of about the right size. They will be required to brush away the bubbles during the action of ebullient mordants, and must not be strong enough to break off little particles of ground among the lines, which a brush might do.

Oil-cans.—Procure three, two of eight ounces capacity, and one of perhaps four. One of the large cans should be of copper and the other of zinc, so that they may be distinguished at a glance. One is for kerosene and the other for turpentine. You will use both constantly. The small can is for sperm oil.

Tissue-paper screen.—To make this take a large piece of strong pasteboard, about 20 x 24 inches, and with a sharp knife cut out a frame about two inches wide. Lay it flat and paste a sheet of white tissue-paper to it. Put paste all along the edges so that the

paper will be comparatively smooth after the paste dries.

A light wood frame, with small cross-pieces fitted into the corners to give rigidity, can also be used for mounting the paper.

The object of the screen is to diffuse and soften the direct light from the window, which, when you face it in working, strikes the plate and reflects unpleasantly into the eyes. By interposing the screen you will be able to see your drawing much better, and get about the same light effect on it as you would have out-of-doors. A simple method of keeping the screen in position is to attach a string to the centre of one of its long edges and fasten the other end to the middle of the window sash in front of your table, with a tack. Put two more tacks in the table, against which the lower edge may rest in such a position that the screen will hang forward at the proper angle. You can work at night with a strong light back of the paper.

More elaborate and expensive screens can be constructed with the use of ground glass and a more substantial frame, and be adjusted more permanently, but the foregoing directions will illustrate the principle.

When through with the screen hang it up flat against the wall to preserve the paper.

Magnifying-glasses.—Two will be required. One should be about five inches in diameter, magnifying

about three diameters, which is stronger than an ordinary reading-glass. It can if desired be mounted on a standard or rack to which it can be clamped and held at the proper focus. For fine detail drawing, and the examination of delicate point work, it will be of great utility. The other should be a small glass, magnifying about ten diameters, which will be needed to ascertain how far the acid has gone into the lines on the plate. This you cannot dispense with. Keep the glasses in chamois-skin covers, with gathered openings, when not in use, to avoid injuries to the surfaces.

Bunsen burner.—This can be connected with a gas fixture by means of a gashose, which should be rather long to permit the burner to be moved about freely. Have a special attachment put between the end of the gas pipe and the bracket, so as not to interfere with the use of the light. The Bunsen will be used for a variety of purposes.

Wires.—Stretch several lines of wire the length of the studio, from the tops of the door and window frames, and secure them firmly with strong screws. They should be high enough to prevent the damp blotters and paper, which you will hang on them, from interfering with the free use of the room.

Wooden clips.—These are three and a half inches long, shaped like a narrow letter V. A strong spring

holds the points together. On one side at the top is a small piece of bent wire forming a hook. Get half a gross and keep them in a box by themselves when not in use. They will be used on your wires.

Cabinet nests.—The use of these small glazed earthenware saucers has been described in connection with stopping out varnish.

Scraper.—This is a tool with a three-edged blade, shown in the illustration. The blade should be about three inches long and kept very sharp. It is used for cutting away portions of the surface of the copper when required.

Burnishers.—These come in various sizes and shapes. You ought to have at least two, one with a curved point about an eighth of an inch in diameter, and the other with a smaller point for finer work. They should be of highly polished steel and kept in perfect condition by rubbing them on wood with oil and emery flour. Otherwise they will get rusty and scratch the plate. They must always be in a condition to impart a high polish to the copper on the spots where they are used.

The burin, or graver.—The engraving tool is employed in deepening etched lines when desirable and to

correct small spots in your work where the acid may not quite have accomplished its purpose.

Roulettes.—The advisability of the use of the roulette on an etched plate is sometimes questioned. It is contended that the resources of the needle and drypoint render it unnecessary. Some delightful effects are however obtainable with it when judiciously handled. It consists of a small steel wheel covered with little sharp points, which penetrate the copper when pressure is applied. It is mounted on a small axle in the end of a piece of metal, with a wooden handle. The dots made take the ink in printing as in mezzotint, and with much the same effect. They are made in many shapes and sizes. Do not be afraid to try them.

Felt block.—A solid piece of fine felt, about an inch and a half square and three or four inches long, will be convenient for polishing purposes in connection with powdered pumice-stone, emery and crocus powder.

Willow charcoal.—Engravers use charcoal of various grades for reducing light lines by friction. That made from willow has a good cutting tooth. Ordinary charcoal will not attack the copper sufficiently to be of use.

Scales.—For general use in the studio a scale such as photographers use in weighing small quantities, up to a pound, will be very useful.

Chemical supplies.—Buy your chemicals in the original packages or bottles, as they come from the manufacturing chemists, when possible, particularly the acids. A list of the necessary chemicals will appear in the recapitulation of materials needed. All of the fluids should be kept in bottles with glass stoppers.

Leather tool-case.—An illustration of a compact and convenient leather tool-case will be found on page 41. A manufacturer of leather goods can make one for you. It slips easily into a side pocket, or drawer, and is of the greatest utility. Keep your small tools in it when not in use. It preserves them from injury and the danger of being misplaced. Have your name and address stamped on the leather inside the outer flap. In case of accidental loss this will probably result in its recovery. The case can be so arranged as to contain two burnishers, a scraper, oilstone, tube of ivory black oil colour, several etching- and drypoints, roulettes, one or two small brushes, and other articles. The brush handles can be cut down to the necessary limit of length. The handle of the large burnisher can be removed, the point for the handle can be cut off, and the upper end of the tool ground round and smooth. It is better to do this with a

long burnisher in any case. A convenient oil-can for the case is the kind sold by dealers in sporting goods for use in oiling reels. It is a small cylindrical metal tube, three inches long and half an inch in diameter, with an oil-proof screw top to which is attached a metal dropper running down into the oil.

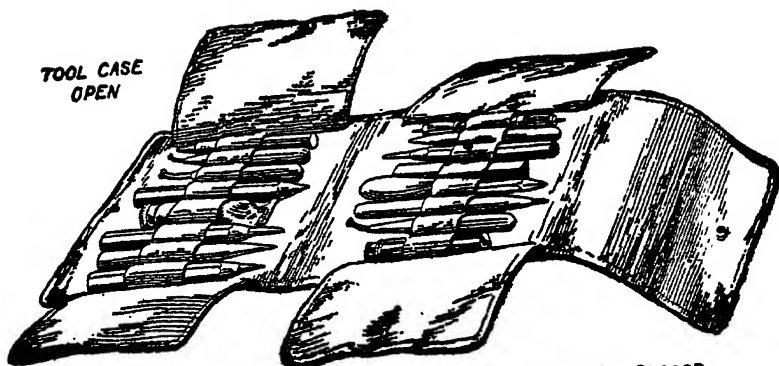
When the case is opened out to its full length, it is about 18 inches long. Two pairs of flaps should cover the two rows of tools inside, and a snap clasp should be provided near the end of the outside flap to secure it when closed. When folded up the case will be about 5 x 6 inches and a trifle over an inch thick.

With two grounded plates in a photographic plate-holder in one pocket and the leather pocket-case in another, you will be very well equipped for out-of-door work.

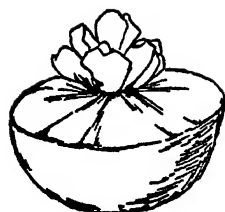
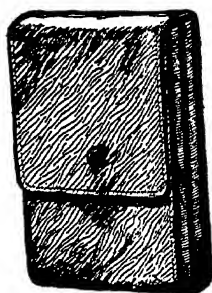
Materials used in connection with printing.—If you take up the art of etching seriously, it is essential that you be able to do your own printing. The materials connected with this part of your work should be kept well covered and out of the way, except when required for use.

The press.—The most expensive and important item in your printing equipment is the press. Several small presses are now on the market which will print plates up to ten inches wide satisfactorily. They cost, new, about

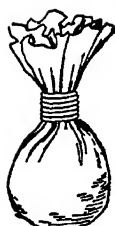
TOOL CASE
OPEN



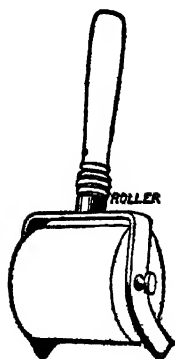
TOOL CASE CLOSED



DABBER



BALL OF
ETCHING GROUND



ROLLER



HAND VISE

\$60.00. With some enquiry you can probably pick up a second-hand one, which should be much cheaper. A good press will last a lifetime and if you can find a second-hand one in good condition it will answer as well as a new one. The bed should be about 12 x 26 and about three quarters of an inch thick. Steel and copper engravers and printers often have second-hand presses for sale, and the engravers' supply houses may be able to direct you. Some discouraged etcher, whose enthusiasm has ebbed away among his materials, may be able to help you out. The illustration will give you an idea of what you want.

The press should be securely bolted to a heavy, strong bench or stand. Rigidity is essential and you must attain it in some way. When the press is properly mounted the bed should come about to your waist when you are standing before it. The handles should turn in a space between the bench and a wall so that they will be out of the way. Keep the bearings well oiled. Wipe the press thoroughly with a greasy rag before you cover it, to prevent rust.

Blankets.—Fine felt blankets for plate printers' use are sold by felt dealers. Any plate printer will tell you where to get them. You will need two blankets of fine velvety quality and several a little coarser. The one laid on top, next to the roller, may be quite coarse. They should be about as wide as the bed of the press and

about sixteen inches long. Smaller ones can of course be used for small plates. When through using hang them up to dry. When they get dirty they can be washed in cold water with soap and a nail-brush. Be sure however that all of the soap is dissolved out of them afterwards. Pliability can be restored by manipulation with the hands. The function of the blankets is to compensate the pressure of the roller so that the damp paper can be moulded into the lines of the plate.

Ink.—The inks sold by ink houses for use by printers of engravings, and known as copper-plate inks, will generally be found satisfactory.

The best black ink is that made from Frankfort black and burnt linseed oil. Acetylene black and other lampblacks can also be used. The burnt oil is very different from the boiled. The latter is too sticky. The inks ground in very heavy oil have too much adhesiveness and must be modified with a thinner oil before use.

The oil used in grinding the ink should give it a peculiar "buttery" feeling under the palette knife. If the ink is too stiff the plate suffers from the increased friction necessary in wiping. The edges of the lines begin to feel it first. If it is too thin the rag takes it out of the lines. A few trials will indicate the proper consistency. Have a supply of the medium and thin burnt oil at hand to enable you to work the ink into the right condition with a strong palette knife.

Copper and steel plate inks come in all colours. Except for very special purposes you will need only the black and the earth colours, burnt sienna and burnt umber. Be cautious in using any of the mineral colours, vermilion for instance. The mercury in it renders it unfit for use on copper, although it does not injure steel, and is unaffected by it.

The black when used alone is usually too cold for most subjects, and it is necessary to warm it with burnt sienna or burnt umber. A brilliant rich colour is obtained by adding a little orange cadmium oil colour to the black which has already been warmed with burnt sienna. The cadmium is quite expensive but not much of it will be required. You can also use yellow ochre or chrome yellow to modify the black and burnt sienna. The colour of the ink is a matter of personal taste and judgment, but do not get too far away from the warm black as a base.

When you buy your ink, get a quantity of the wax-paper disks, which just fit the inside of the can, and which are pressed down against the top of the ink before the cover is put on. A "skin" forms on the surface of the ink in the can when it is left open and exposed to the air, which temporarily protects it, but continued exposure thickens this "skin" until the ink finally solidifies. The wax-paper disk is a substitute for this "skin." After removing ink from the can, shape what is left in it to a smooth level surface with a palette knife, and fit

the wax-paper disk down over it, then gently press it into uniform contact with the ink. This will exclude the air and preserve the contents of the can.

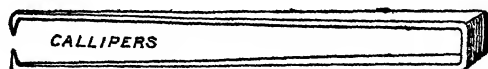
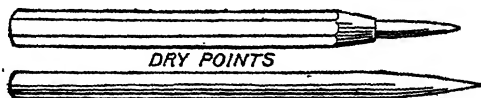
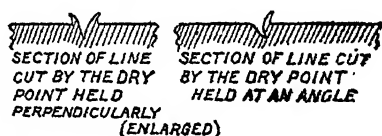
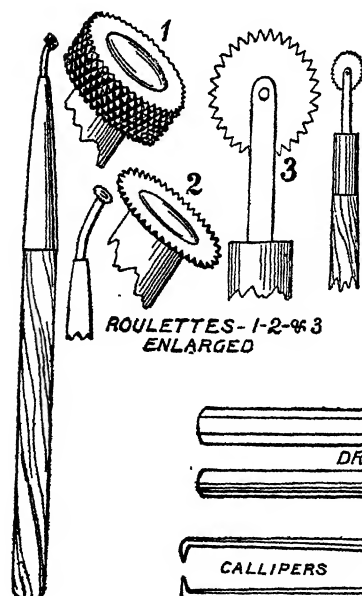
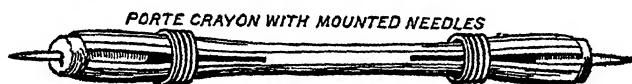
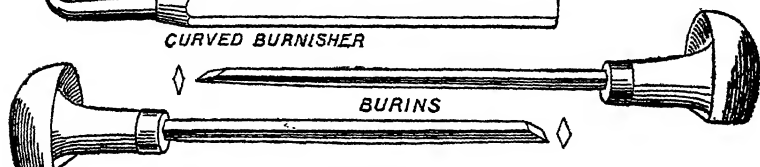
Ink can also be stored in large collapsible tubes, but the objection to this is that in order to fill the tubes properly the ink must be thinned more than is usually advisable. If it is put into the tubes too thick, air-chambers are liable to be left in the mass which will cause deterioration in working quality.

The proper care of your ink is of the utmost importance. It is to be your final medium of expression, and you cannot devote too much attention to it. If it is not in proper condition when you are ready to use it, you will have to suspend operations.

Some excellent authorities maintain that ink used in printing etchings should be made by the printer and used fresh, claiming that it loses quality if left to stand.

Ink is not at all difficult to make, and if you are a genuine enthusiast, you will want to do it. If you make your own ink, keep at least a small amount of the manufactured article on hand, so that it will be available for trial proofs and other occasions, when for some reason you may especially need it. To make your ink you will require the following materials.

The ink slab can be a piece of lithographic stone, or marble slab, twelve or fourteen inches square. A piece of hard marble will probably be more available, as you



may have some difficulty in obtaining a lithographic stone that is not too thick and heavy. The slab should be about an inch thick, so that it can be conveniently handled, and set away on edge behind a bench against the wall when not in use. You can get a slab from a marble worker, or possibly from a plumber, who may have a piece of marble from a dismantled washstand. It should always be carefully and completely cleaned after using.

The muller is a heavy round stone pestle, sometimes cone-shaped, with a flat bottom, slightly rounded along the edge. It can be procured from the lithographers' or engravers' supply houses. A large glass pestle, which the druggist may have, or can order for you, will answer. It should be at least two and a half inches across the bottom, which must be quite flat.

The palette knife for working ink should have a long, strong, and pliable blade, about an inch and a half wide. Keep your palette knives in good condition by wiping them carefully with a greasy rag before putting them away.

The plate warmer must be of iron. If you find it difficult to buy one ready made, it is a simple matter to have it constructed by a blacksmith or sheet metal worker. It can be made of two sheets of iron, about

9 x 12 inches square, and from an eighth to three sixteenths of an inch thick. The sheets can be pierced at the four corners and securely connected by iron legs about four inches long and a quarter of an inch thick. A circular hole, about four inches in diameter, should be cut in the centre of one of the sheets. The Bunsen burner can be placed in the heater and you will have the advantage of the flame under the opening when needed. For most purposes, however, the warmer will be used with the plain side up.

Frankfort black, burnt sienna, and burnt umber should be obtained from the ink houses. They must be of the very finest quality, free from grit and foreign matter of any kind. Acetylene black, and some of the other lampblacks, make beautiful ink. The earth colours which you would get from the ordinary dealer in paints and oils would not do.

Burnt oil.—Be sure, when you ask for burnt oil, that you get exactly what you ask for, and do not accept any assurance that the boiled oil will do just as well. The ink houses will furnish it. Get only the medium and thin grades, a can of each. Linseed oil is burned by placing it in a kettle, heating it to the boiling point, and then igniting it. It is allowed to burn until it has reached the desired consistency, which will require several hours. It should be ladled occasionally. The

work must be done out-of-doors. It is a tedious operation, and you should have no difficulty in obtaining good oil already prepared.

To make the ink.—Gradually mix the Frankfort black, or other black which you may wish to use, and the oil on the slab with the muller or palette knife. Add the burnt sienna or burnt umber to the extent to which you may wish to warm the black. After working the ingredients well together, use the muller, grinding the mixture thoroughly and for some time, with a circular movement, until it is perfectly smooth. The proper condition can be determined by working it over with the palette knife, and trying a little of it on your finger. It should be quite stiff.

Make up only about what you expect to use, and discard any that may remain after you have finished printing. It is nasty stuff to leave exposed, and it is well to scrape off what is left and transfer it to a piece of paper, which can be folded and thrown into the fire.

Solvents for ink.—Your hands will become as the shades of night, and a fine sombre effect will probably extend to your elbows, when the printing gets well under way. A rag saturated with kerosene will remove most of the ink, and patience, soap, warm water, and a hand-brush will take care of the rest.

Theatrical cold cream, lard, any oil or soft grease

can be used before you get to the soap. There is a vegetable oil compound, sold at the grocers, as a substitute for lard, called "Crisco." Whatever its merits may be as a food, it is an excellent solvent for ink. A can of it is much cheaper than cold cream and it answers perfectly. These solvents leave the hands in much better condition than if soap and water are depended upon entirely.

The ink roller should be of rubber, and has already been described. It must be thoroughly cleaned with turpentine, and well wiped, to remove the solvent, after you have finished printing for the day. If ink is allowed to dry on it, there will be difficulty in getting rid of it.

Never leave oil on rubber.

The ink dabber, which many printers prefer to a roller, can be of kid or some other soft leather. Directions for making one will be found on page 29. It must be cleaned thoroughly after use with turpentine. An excellent way to use an ink dabber is not to use it at all. The roller is much better.

Rags.—Procure a plentiful supply of the cheaper grade of unbleached cheese-cloth, a bolt of stiff white mosquito netting, and a lot of old soft muslin rags. Never leave oil or ink saturated rags lying around in confined spaces. They are liable to spontaneous com-

bustion. Burn them or they may burn themselves and everything else.

Retroussage brush.—The greater part of the retroussage work on the plate will be done with the cheese-cloth, but some most exquisite effects can sometimes be obtained with a long-haired broad flat brush when skilfully used. It should be two or three inches wide, made of skunk or badger hair. The hair must be of just the right stiffness to leave very fine hair marks on the tinted surfaces to which it is applied. A brush which is too soft and fine will give a smudgy effect, and the desired vibrant quality will be lost.

Blotters.—Get a quantity of the heavier grade of white blotters which come in sheets 19 x 24 inches. Have them cut in half so that they will be 12 x 19 inches. These sheets can be cut into smaller sizes as required. They will be used for several purposes which will be explained later.

Copying press.—This will be convenient for keeping proofs under pressure when drying between blotters. It should be large enough to admit the blotters and drawing-boards. A second-hand one can be procured which will answer just as well as a new one. The press should be bolted onto a rigid stand. You can dispense with it by using the bed of your etching press for a

weight, or by putting some other heavy article on top of a drawing-board.

Paper.—There has been a great deal of controversy regarding papers suitable for etchings. Different papers are adapted to different plates, inks, and subjects. Proper harmonies between paper and ink tones must be well studied. The spaces on the plate, on which there are no lines, are as important as the bitten work, and in the finished proof it is the luminosity and tone of the paper that gives the lines their light and colour value. The surface can have a strong rich light-carrying quality, without being shiny. A glazed surface is objectionable, and a cold dead surface destroys the life in a proof. Harsh surfaces are also unpleasant, and lack sympathy.

A volume could be written on the subject, but it seems advisable to confine our consideration to material which will be the most desirable at the beginning. The field is so large that you can go into it and roam at will after you have acquired proficiency in the use of papers that will fully answer the purpose.

The imported hand-made and the Japanese fibre papers are most generally used. They come in all sorts and sizes. Some of the domestic machine-made rag papers work well. Those made from wood pulp are utterly worthless, except for working proofs. Almost any variety, which is not too smooth, and has sufficient body, will do for these.

Some of the very best hand-made papers come from England and Holland. Splendid products are also obtained from other European countries. The charcoal and water-colour papers, sold at the artists' material stores, are usually very good. Those with warm white tones should be selected. Cold, pure white surfaces, which look as though they might have come from a laundry, should be avoided. Some etchers soak white papers in weak solutions of coffee or tobacco to obtain particular tones.

Most of the Japanese papers are almost entirely hand-made, the mechanical aids to the process being very few. The fibres composing them come from the inner barks of three shrubs, which grow only in Japan, known as Mitsumata, Kozu, and Gampi. The first two are cultivated, but the Gampi grows wild.

The use of the lighter and softer grades of Japanese paper is not advised at first. They are very tempting, but quite difficult to handle when damp. They are semi-transparent, and when mounted on white surfaces are very luminous, and have much mystery and warmth of tone.

One objection to the use of Japanese papers is their cost. This also applies to some of the other imported papers. A little care, however, will enable you to procure good material at a reasonable price.

The tough velvety texture of Japanese vellum, and its luminous quality, after its excess of sizing has been

disposed of, strongly commend it. It yields a beautiful proof when properly handled. When well dampened, it is very soft, and will go into the fine lines almost as perfectly as wax, but considerable experience is necessary to insure good results. It is not always uniform in quality, and some lots appear to be more heavily sized than others. The colour usually left on it by the manufacturers is not permanent, and will fade upon continued exposure to light. This must be calculated on in using it. The heavier grades are preferable.

Some etchers wholly condemn Japanese vellum, but prejudice, and lack of knowledge of its proper use, are responsible for much of the objection to it.

Old paper.—The odd corners of Europe have been ransacked for years for blank sheets of hand-made paper from very old books and documents. These sheets are highly prized on account of their fine quality and the rich mellow colour which time has imparted to them. This colour is caused by the decay of the size used in making them. Some of them have beautiful rich golden tones and wonderful textures. The water-marks are most curious and interesting.

A twentieth-century etching printed on fifteenth-century paper may suggest an anachronism, but nevertheless these odds and ends, which have so well endured the flight of time, are most alluring, and very appropriate for special subjects. Indiscriminate use of them

savours of affectation. They are imitated by many modern products.

The sheets must be cautiously handled when damp, as, owing to the disintegration of their size, they tear easily when wet. Do not allow any more water to get into them than necessary.

Care of paper.—Keep your paper flat and well wrapped up, until you wish to use it, in a dry place, safe from dust. Never roll it if you can avoid it. Rolled paper is difficult to handle, and is liable to be crushed.

All unused damp paper should be immediately dried and laid away flat.

Recapitulation of materials.—In the following list you will find items which have not been described for the reason that their use is apparent, or because they will be mentioned in the text in connection with methods of work.

You may not always be able to find what you want by enquiry of the dealers named, as stocks of goods vary in different parts of the country, but the list will be found approximately correct. In some cases a dealer will be able to direct you, or will order especially for you any article which he may not have in stock.

Several things which you should make yourself are included in the list, for convenience in case you prefer to buy them. You should know the composition of

everything you use, and should take the time and trouble to make it when possible. There can be no drudgery in an art that you love, and you should find the preparation and care of your materials a pleasant task. The odour of kerosene may be as the perfume of a rose, if it comes at a happy moment, and acid stains on your clothing will often recall welcome memories. After all we are controlled by our points of view, and the delight of one hour may be the misery of another.

Some of the suggestions and comments accompanying the descriptions should really be made in connection with methods of work, later on, but at the risk of repetition they have been included in this part of the treatise to insure a more complete understanding of the functions and properties of the supplies you will need.

When you have learned to use the materials of the art, you will find yourself constantly devising little conveniences of your own, and resorting to expedients which are not in the books. It is entirely proper for you to do this, and the only object of this treatise is to get you started as safely as possible.

The list is classified for convenience in making memoranda for your shopping tours.

MATERIAL	SOURCE OF SUPPLY
Nitric acid C.P. (1 lb.)	The druggist.
Hydrochloric acid C.P. (1 lb.)	"
Perchloride of iron (1 lb.)	"
Chlorate of potash	"
Gum mastic	"

MATERIAL	SOURCE OF SUPPLY
Burgundy pitch	The druggist.
Ammonia	"
Lampblack	"
Zinc white	"
Glass graduate	"
Carbonate of soda	"
Sperm oil	"
Chloroform	"
Alcohol	"
Turpentine	"
Whiting	"
Pipette	"
Asphaltum	" or paint and oil dealer.
Powdered pumice-stone (fine)	" or dealer in engravers' supplies.
Theatrical grease paint	" or dealer in theatrical supplies.
Hand-vise	Hardware store.
Large vise	"
Files	"
Metal saw	"
Oil- and whetstones	"
Oil-cans	"
Callipers	"
Bunsen burner	"
Wires for studio	"
Water or electric motor	"
Emery wheel	"
Fine stone wheel	"
Emery rubber	"
Nail punch	"
Finest emery paper	"
Sandpaper	"
Emery flour	"

MATERIAL	SOURCE OF SUPPLY
Soldering outfit	Hardware store.
Crocus powder	" or dealer in engravers' supplies.
Small anvil	" or dealer in jewellers' supplies.
Scraper	Engravers' and lithographers' supply dealers.
Burnishers	"
Burins	"
Roulettes	"
Willow charcoal	"
Muller	"
Pumice-stone sticks	"
Slate sticks	"
Plate warmer	" or made by blacksmith or sheet iron worker.
Ink dabber	" or ink dealers.
Ink slab	" or marble worker.
Rollers	" or artists' material store.
Ball of etching ground	Artists' material store.
Liquid etching ground	"
Stopping-out varnish	"
Etching needles	"
Drypoints	"
Dabbers	"
Drawing-boards	"
Brushes	"
Cabinet nests	"
T-squares (12 inch)	"

MATERIAL	SOURCE OF SUPPLY
Palette knives	Artists' material store.
Ivory black oil colour	"
Chinese white water colour	"
Tracing paper	"
Transfer paper	"
Celluloid tracing sheets	"
Large thumb-tacks	"
Photographic plate-holders	Photographic supply dealers.
Enamelled ware trays	"
Glass funnel	"
Scales	"
Wooden clips	"
Gum labels for bottles	" or stationer.
Plates	Copper and steel plate dealers.
Asphaltum-turpentine varnish	Paint and oil dealers.
Felt blankets for press	Felt dealer or engravers' supply house.
Felt block	"
Magnifying-glasses	Optician.
Standard or rack	"
Ink	Ink dealers.
Frankfort black	"
Burnt sienna	"
Burnt umber	"
Burnt linseed oil	"
Paper for printing	Paper dealers.
Blotters	"
Press	Manufacturers of printing-presses.
Cheese-cloth	Dry-goods store.
Mosquito netting	"
Copying press	Stationer, or dealer in second-hand office supplies.
Leather pocket case	Manufacturer of leather goods.
Copper amalgam, and accessories	Dental supply house or den-

CHAPTER III

METHOD

DESCRIPTIONS of nearly all of the materials and tools to be used will be found in the preceding pages, which can be consulted when necessary.

Before attempting the serious practice of your art it is desirable that all preparations be complete. The studio should be conveniently arranged and properly lighted, and the required materials easily accessible. You should be physically and mentally comfortable, and be imbued with inspiration and enthusiasm, without which successful creative art work is impossible. A psychological element enters into what you are about to attempt which is essential to success. Petty annoyances and interruptions of any kind should be strictly guarded against, as many fine plates have been ruined or made impossible by even slightly disturbing influences. Artistic inspiration, like a delicate plant, can only come from fertile soil, and it must have congenial environment if it is to bear a flower. A valuable idea is often lost for lack of means of immediate expression. Keep some grounded plates in your plate-holders, ready for

the needle, so that your ideas may not be impeded or diverted by mechanical preparations when the impulse comes.

After you have etched a few plates you will fall naturally and readily into the method and will not have to bother yourself as to the best way of managing some particular detail of the process. You will soon discover a path of your own which you will habitually follow. It is not necessary that your materials, tools, and methods should be precisely like those of somebody else. After you have obtained a good working knowledge of what is to be used, and how to use it, you will have no difficulty with the practical side of the art, although the detailed explanations which are desirable in a text-book may seem a little complicated at first. When you have found a particular formula, tool, or method which answers your purpose perfectly, adopt it, and do not waste time and energy in concerning yourself with any other. The field, apart from the materials and methods, is large enough to attract your finest thought and greatest talent.

Preparing the plate.—Clean the plate thoroughly with a rag and turpentine; and afterwards go over it with a clean cloth charged with whiting, so that no traces of grease or foreign matter of any kind may be left upon it. Remove all the specks of whiting without touching the surface with your fingers. When the

plate comes from the manufacturer it usually has a "mirror finish." It is apparently clean but if you examine the turpentine rag after applying it to the plate you will find it somewhat soiled. In order to insure the perfect adherence of the ground it is frequently necessary to reduce the "mirror finish" with turpentine and willow charcoal.

In applying the charcoal, rub it in the direction of its grain. You will soon find the angle at which it will work. Keep the slight grain made by the charcoal on the copper in the direction of the length of the plate, unless you have a reason for wanting it to run the other way. The charcoaled surface is a little rougher than that left by the buffing wheel on the new plate, and would show a slight grey tint in printing. It can be removed at any time with a felt block and finely powdered pumice-stone. The "mirror finish" can also be destroyed with emery flour applied with a rag charged with turpentine. In grounding a very highly finished surface you will sometimes discover little bare spots where the ground fails to adhere, no matter how thoroughly and carefully it is applied. You can often avoid this by cleaning off the ground with a rag, while melted, without the use of turpentine, and regrounding. The best plan, however, is to get rid of the "mirror finish" in the first place, for it will not be desirable at any time.

The matter of texture on the surface of the plate will be considered in another connection. We are only

concerned with it now in relation to the ground, which naturally adheres better when the copper is not too highly finished.

If the plate has been exposed to the air for a long time it has probably become oxidized and discoloured. Use the charcoal and turpentine until you have an even bright surface, which is necessary to enable you to see your drawing properly when you get to it.

Laying the ground.—Clamp the plate firmly into a hand-vise by one of the corners if it is a small one, or by the middle of one end if it is a large one. If the jaws of the vise have not been faced with leather, put a small piece of blotter between the iron and the polished side so as not to mar the copper. Heat the plate, face up, until it is just hot enough to melt the ground through the silk wrapper when the ball is gently rubbed over it. Too much heat will cause the ground to boil and finally become burnt, in which case it is ruined. While the plate is still hot lay it on a table, remove the hand-vise, and distribute a small quantity of the ground around on the surface with the ball. Before it has had time to cool, go all over it with the dabber, rapidly and firmly at first, and then more gently, until a thin film of ground uniformly covers the surface. If the plate has cooled so that the ground has become a little too hard to work freely before the desired result is attained, reheat it slightly. When the operation is finished the lustre of

the copper should be visible through the film. If the covering is too thick the needle will not work freely and cleanly.

This is the oldest, and I believe the best way to apply the ground. It can, however, be put on with a roller and many etchers prefer that method. A simple way is to lay two plates on the plate warmer, with a low flame from a Bunsen burner under it. When exactly the right heat is obtained melt a little of the ground on the extra plate and roll it until the roller is evenly charged, then go over the surface of the plate to be grounded, rapidly, several times, in all directions, until you have obtained a perfectly uniform and thin distribution of the hot ground. A little skill and experience is required to do this properly, and much care must be taken not to let the ground on either plate get too hot. If the surface of the plate is not uniformly level this method will be impractical and you will have to resort to the dabber.

If you prefer to use liquid ground, hold the cold plate level on your hand and pour the ground on it, flowing it around until the surface is fully covered. Pour off the excess from one of the corners into the bottle, which must be recorked immediately. Tip the plate around a few times and see that the fluid lies equally all over it. Lay it on a level surface to dry. A short time will be required for the chloroform to evaporate sufficiently to enable you to smoke the plate. Be very careful about

dust specks on the copper before you begin and see that no dust gets on the wet surface before it dries. The advocates of this method commend it highly. Perhaps you may become one of them.

Smoking.—It is necessary that the grounded surface be smoked to enable you to see the lines which you will draw on it with the point. The lampblack from the flame must be incorporated into the ground and not deposited on its surface. To accomplish this the ground must be smoked while it is melted. Replace the plate in the hand-vise, protecting the edge with the small piece of blotter before mentioned, and gently warm it until the ground is melted all over the plate. Pass it face downward rapidly back and forth in all directions through a large gas flame until the surface is uniformly black. The plate must not be held still a moment in contact with the flame or a burnt spot will result. This will be indicated by a dead-looking place when the plate cools, although these dead spots sometimes result from an excessive deposit of lampblack. In either case the plate must be cleaned and the operation repeated until, when cold, the surface is of a perfectly uniform dull black.

The flame from a gas jet is better than that of a candle or wax taper, either of which can be used in the absence of gas. The lampblack from an oil flame is greasy and sometimes affects the ground unpleasantly.

Take the plate from the flame several times during the process and allow it to cool partially or you may have difficulty in avoiding burns. Be cautious about the centre of the plate and see that it does not get more than its share of the flame. A quite rapid circular movement, keeping rather towards the sides and ends, will insure a better distribution.

Considerable skill is required to smoke a plate properly, but with a little care and experience you will be able to manage it.

The drawing.—We have now come to a vital part of our subject. Your plate is ready to receive its breath of life, and only a few practical suggestions can be made to you, outside of some general directions and observations. Your own acquirements and art knowledge must guide you until we are ready for the acid.

Do not harbour the idea that the drawing is merely a rapid and hasty sketch. The work of your needle is worthy of your deepest thought and study, but the final proof must not bear the evidence of laborious effort.

Remember that etching, like any other art, has its limitations, and you must keep within its range of expression. The beauty or ugliness of some subjects can be interpreted in line, and many others can be more effectively treated in another medium. Do not try to compel one medium to do the work of any other.

You should first feel that you have something to

express, and then express it in the briefest possible way. Every stroke of the needle, however small and light, should have a significance in relation to the composition, or it should not be made. The drawing on the plate, to be successful, should meet several indispensable requirements. It must be properly composed; its units must balance in perfect harmony. It must be executed with a technique that is distinctive and pleasing. The story should be told in beautiful language, and have that intangible, indescribable quality which in literature and art is called style. The subject must in itself appeal to the æsthetic sense. The story must be worth telling, the message worth sending, and it must convey a dominant thought or idea. It must be concise, concentrated, and suggestive to be effective. A master of etching is a master of elimination.

Mr. Frank Weitenkampf, in his excellent work, entitled *How to Appreciate Prints*, says of etching: "Its strength lies in indication, not elaboration; flexibility, not rigidity; the possibility of omission, not the necessity of adding detail; the power of giving a maximum of expression with a minimum of means." Every line in the drawing that you can do without is a detriment to it. Never allow two lines to do the work of one, if it can be helped. As there are no lines in nature, and as their use in art is interpretative and conventional, we should strive to utilize their capabilities of expression to the utmost, in the most simple and economical way.

Economy of line does not mean poverty of line. You cannot dispense with a line which adds quality to your work. You can indicate rich masses with a multiplicity of lines, enough to suggest tonality, when required, and in such cases they are essential. The point is that you should discriminate between significant and meaningless strokes on the copper.

When the drawing is finished, study it carefully, and you will probably find many superfluous lines, which can be covered with a water-colour brush and stopping-out varnish. It is easier to do this than to take them off of the surface with the scraper and charcoal after they are bitten.

Some very interesting observations regarding etched lines were made by Lalanne and Hamerton, to both of whom we are all greatly indebted. The following extracts are from Hamerton's *Etcher's Handbook*.

M. Lalanne, the eminent French etcher, has first given definite shape and expression to a doctrine about lines, which is founded on certain technical necessities and on the practice of the most successful etchers. The student ought therefore to know this doctrine, and remember it when he works, but not to give it a too rigid or formal obedience, because in art the very best of doctrines (and this is one of the best) are liable to become hindrances to the free development of individual ability. An artist ought to know all the best maxims about his art, and yield them an intelligent obedience just so long as they are of use to him, but not one minute longer. M. Lalanne's doctrine is this:

Lines which are to be deeply bitten, ought to be kept apart from each other; those which are to be of medium depth ought to be nearer, and very shallow lines ought to be quite close to each other. To express the doctrine in concentrated form: *The breadth of the white spaces between the lines ought to be in proportion to the depth of the biting.*

To inexperienced etchers, or even to experienced ones who have not much observation, this doctrine of Lalanne always appears a bit of capricious dogmatism. It may therefore be well to explain the reason for it.

I cannot tell you why, but it is a fact that biting always sets in soonest where the lines are nearest together, in the nitric and nitrous baths.

Consequently, if you want any one biting to go on evenly, the lines exposed during that biting must be tolerably equidistant. There must not be very close work in one place and very open work in another place. The close places would be deeply bitten before the solitary lines were even attacked. . . .

The distinguished English etcher, Mr. Seymour Haden, advocates a doctrine about the line distinct from that of Lalanne, which equally deserves the student's attention. Mr. Haden's doctrine is, that the etched line, being, on account of its extreme and even unrivalled obedience to the slightest variations in the will or sentiment of the artist, precious in the highest degree as a means of artistic expression, ought to be frankly shown and not dissimulated, except under circumstances where its vital accents are necessary.

The difference between this doctrine and the ordinary feeling, both of painters and the public, is very great. A painter, from his habit of working in a medium which excludes the line altogether, and deals only with graduated spaces, has usually a feeling of embarrassment about the line, and a desire to hide it as much as possible under gradu-

ated tones. In other words many painters, especially of the English school, attempt to paint with the point rather than etch with it. . . . For my own part, though fully recognizing the fine tone and clever drawing of the best members of the English etching club, I believe Haden's doctrine to be the right one, namely, that the line ought to be preserved and made the most of.

The brilliancy of the copper on the black ground is somewhat deceiving, and causes the lines to appear wider and closer together than they really are. There is also an optical illusion when the bitten plate is cleaned. Owing to the radiation from the bright surface, an opposite effect is produced.

It is well to avoid cross hatching as much as possible, as the acid is likely to attack the little corners where the lines cross.

There are two ways of making the drawing with reference to the work of the acid. One is to complete the entire drawing before putting the plate into the bath, and successively stop out the various lines as they become sufficiently bitten. The other way is to draw only the lines which are to be the deepest and heaviest in the proof, bite them, and then add the other lines, successively biting as you progress, and finish the plate with the slight biting required for the lightest lines in the subject. This method makes the use of stopping-out varnish unnecessary.

After you have had some experience you will find

that a judicious use of both methods will be advantageous, and by skilful variations of them you will be able to intermingle light and heavy lines at will.

For instance, if the subject is a landscape, with a delicate sky behind the bare branches of trees, you would hardly find it possible, without infinite pains, to stop the sky out effectively to the edge of every line among the branches. In such a case it would be better to draw and bite the sky, and then clean and reground the plate, being careful to see that the work already bitten is completely protected. Another way would be not to attempt the sky until all the rest of the drawing had been bitten and a proof obtained. The plate can always be regrounded, and worked on, without affecting lines already bitten, and by not smoking it you will be able to see all of the bitten lines distinctly. The deeper ones are easily discernible if the later ground is smoked.

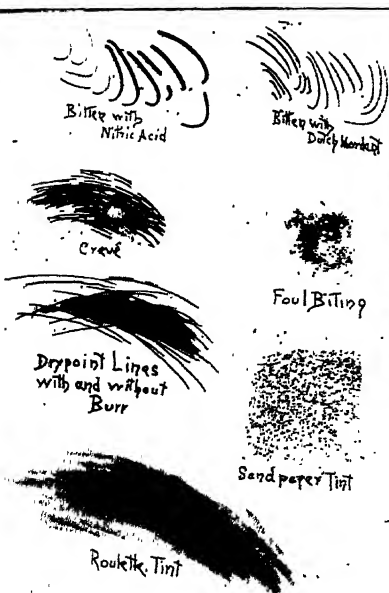
So many expedients are possible in connection with the drawing and biting that it would be impracticable to mention all of them. Each plate will present its own problems, and with the foregoing suggestions your own ingenuity will help you out.

In using the needle be sure that the pressure used completely removes the ground from the copper. If you are using a heavy point this will take care of itself. Lay a blotter under your hand to protect the ground from abrasion. The ground will stand a great deal of careful handling but it must be watched. Any acci-

dental scratches can be covered with the varnish. When the drawing is finished, or a portion of it is ready for the acid, paint out all exposed parts of the plate that you do not wish the acid to attack, with stopping-out varnish. Be sure that the back is fully protected, as well as the edges. Lean it against something and let it dry for an hour or so, and then touch over the spots where it rested in drying. Wait until the varnish is dry enough, so that it does not stick to your finger when you touch it, before putting the plate in the bath. It is better to let it dry over night if you are not in any particular hurry, but usually you will be.

Reversing and transferring.—If the subject is of a purely artistic nature, it will not be necessary to reverse it. There is no right and left in composition or artistic arrangement. If the etching is to represent some particular place, or architectural subject, it should be reversed on the plate so that it will be recognized in the proof. It may happen in drawing a portrait that the hands are so posed that a right-handed person will appear left-handed in the proof. A little forethought in posing the model will usually take care of this.

You can work on the plate with your back to the subject, with a mirror on an easel in front of you, very comfortably, but if you do this in the street you will attract a large and interested audience. A reversed print from a photographic negative of the subject will



be of value in such a case. If a photograph is utilized, it should be made with a lens of long focus. If it has been made with a wide-angled lens, such as is commonly used by commercial photographers, the perspective will be unduly distorted. We often see etchings of architectural subjects which clearly indicate the use of photographs to an expert in the use of lenses.

Another method is to make a tracing of a sketch of the subject and transfer it in reverse to the grounded plate. To do this take a celluloid tracing sheet—they come very thin—and trace the drawing with a sharp steel point, afterwards removing the burr gently with a scraper. Rub a mixture of cold cream, lard, or similar medium, and powdered chalk or zinc white, into the lines made by the point. Reverse the sheet of celluloid and secure its contact with the grounded plate with thumb-tacks on a drawing-board. The thumb-tacks can be pressed in along the edges of the plate, and the tops will hold it in position. Go over the lines with a burnisher, without applying too much pressure, and upon the removal of the sheet, the tracing will appear in white lines on the black ground. You can then proceed with the needle work.

You may also make the tracing on ordinary semi-transparent tracing paper, reverse it, and lay a sheet of white transfer paper between the tracing paper and the grounded surface, securing the sheets and plate with thumb-tacks as before. Go over the lines with a point

that will not tear the paper, a sharp pencil for instance, and by applying the right pressure, the desired result will be attained. The coating on the white transfer paper, usually sold at the artists' material stores, is composed of six parts of lard to one part of white wax, melted together and charged with zinc white. It is applied to the paper thinly with a brush while warm.

It is often convenient to fasten a sheet of white transfer paper over the plate, and sketch on it lightly with a soft pencil. When you get what you want, a hard pencil can be used, and with a little pressure the desirable portions of the sketch can be transferred to the ground. This method will give you the benefit of a little latitude and study, in an experimental way, before you finally decide on your composition, and begin work with the point. It is useful in out-of-door work from nature and will often obviate the necessity of regrounding the plate.

A drawing or tracing on thin paper, made with a soft pencil, can be transferred to the surface of the ground by the use of the press. Dampen the paper, lay it over the plate, and pass it under the roller, protecting the plate and paper with a backing of felt blankets, as in printing. Comparatively little pressure will be required to transfer the lines to the ground.

Thin white paper which has been "black-leaded" on one side is also obtainable. The graphite leaves a grey line on the black ground. You can prepare paper

which will work well by rubbing it with a soft pencil, distributing the graphite uniformly, and brushing off the excess.

You can sketch directly on the ground, in a limited way, with a piece of soft white chalk, in the end of a porte-crayon. It must be delicately done so as not to disturb the surface. Chinese white water colour applied with a fine brush will answer the same purpose, although the water colour has little affinity for the ground.

Positive processes.—Repeated experiments have been made to avoid the copper-coloured line on the black ground, which seems awkward at first, as we are accustomed to a black line on white paper. You will soon get used to it, however, and it is better that you should, as none of the methods of whitening the ground have been absolutely satisfactory. Hamerton's positive process is delightful to read about, but with all due respect to its inventor, it is not practicable for the ordinary worker. A full account of it will be found in his *Etcher's Handbook*.

Hubert Herkomer hit upon the idea of obtaining a white surface by the use of grease paint and zinc white. It works well, but the white coating slightly complicates the situation. The point does not always cleanly remove it from the copper, and the lines are sometimes more or less clogged. Delicate brushing will remove the loose material. The addition of the grease paint and zinc

white thickens the protective covering of the plate, but except for quite close point work, this is not particularly objectionable. If you desire to work on a white surface, this is the best way to obtain it.

Herkomer's directions are, in effect, as follows:

Lay the ground—Bosse's or Rembrandt's—in the ordinary way, with a dabber, but leave it unsmoked. Procure at a drug store, or from a dealer in theatrical supplies, a stick of white grease paint, such as actors use in making up their faces, and some zinc white, which comes in a fine white powder. Hold the stick in your left hand, and take from it what you can get by dabbing your finger on it, which you dab back on to the ground that is already laid on the plate. Dab it as equally as possible, but not too thickly.

Then rub into that somewhat soft upper ground, which will be of a pale warm white colour, the zinc white with a soft and rather thick camel-hair brush. The zinc white at once clings to the greasy surface of the grease paint, and the result is a dead white surface like paper. Where the point removes this white ground, the copper shows as a dark brown line. The plate must not be too cold when the grease paint is dabbed on, and the chill should just be taken off when the zinc white is brushed into it, but not more than the chill.

I find, upon experiment with Herkomer's process, that dabbing the grease paint on to the plate with the finger is a tedious proceeding, and it is difficult to apply

it uniformly in this way, particularly to a large plate. Another way is to melt the grease paint on another plate, and roll it around freely until the roller is well warmed and evenly charged with it. Roll it upon the grounded plate, which should be just warm—not warm enough to quite melt the grease paint if applied with the finger. Grease paint melts at a lower temperature than the ground, and we must work within this latitude. By handling the roller delicately we shall be able quickly and evenly to cover the grounded plate with a film of grease paint. It can then cool.

Put a small quantity of zinc white (I find that whiting can also be used) on a piece of muslin, gather it so as to form a bag, and cover the whole surface of the grounded plate thickly with the powder, without touching it with the muslin. This can be done by tapping the bag so that the powder falls from it.

Heat the plate to a degree that will melt the grease paint, but not the ground. The particles of powder will settle into the soft surface and cling to the substance when cool. Get the plate as cold as possible and brush off the surplus powder with a fine long-haired brush, which will not leave hair marks on the surface.

Delicate rubbing with the fingers will insure a more perfect adhesion of the powder to the cold grease paint, before the excess is removed with the brush.

It is important to get the right kind of grease paint. If it is necessary to make it, proceed as follows:

Take 2 ounces of white wax, 3 ounces of prepared suet, and 5 ounces of bismuth oxycarbonate. Melt the wax and suet, stir in the bismuth thoroughly. Instead of moulding the mixture into sticks, put it into a small jar. Portions of it can be taken out with a knife as needed.

A black instead of a copper-coloured line can be obtained in using the Herkomer process, by oxidizing the plate before it is grounded. After cleaning it immerse it for a few minutes in a tray containing a two per cent. solution of sulphuret of potassium. Remove it as soon as the surface is black. The oxidization can be easily removed with charcoal or powdered pumice-stone after the plate has been bitten.

The zinc white gradually comes off in the acid, leaving the grease paint covering on the ground.

Plates prepared in this way must be carefully handled. If carried in the plate-holders, they will be convenient for out-of-door work.

Biting.—Before immersing the plate in the bath be sure that there is no metal exposed that you do not want the acid to attack. Protect the back and edges of the plate with asphaltum varnish. If any little spots are left exposed along the edges, or on the grounded surface, much labour will be required to remove them if they do not receive proper attention before the acid gets to them.

Many etchers have tried to work out arbitrary rules to govern biting but their efforts have all been fruitless. So many elements enter into the problem that it is simply impossible to establish time standards, except in a general and suggestive way. The only reliable method of ascertaining what progress the acid has made is to take the plate out of the bath, wash it, remove the surplus moisture with a blotter, and wait until the surface is entirely dry. Then hold the plate face upwards toward the window, just below the level of the eye, and examine the depth of the lines with a magnifying-glass. You cannot do this satisfactorily if there is moisture on the plate. You will have to depend on these tests until you are able to obtain a proof. In this connection, Herkomer pertinently says: "Failure in biting arises much more from not knowing how wide or deep you *ought* to bite your lines than from any of the difficulties of judging the bitten line before the ground is removed."

The ability to judge whether a line has or has not attained the desired depth must be acquired by experience. Comparisons of bitten lines with the lines on the proof will soon enable you to do this quite accurately.

The nitric or Dutch mordants should not be used until after they are at least a day old, and they should contain just a little copper before you begin—enough to impart a slight greenish tinge.

You will seldom have use for a nitric mordant stronger than one third nitric acid C.P. and two thirds

water. You will find it difficult to maintain a standard strength in any event, and it is safer to err on the weaker side. The milder mordant bites a sharper and cleaner line.

Nitric acid widens the lines much more than Dutch mordant or perchloride of iron. Minute particles of the ground are being constantly loosened and torn away by its activity. It generally attacks the fresh plate unequally. Closely drawn work feels its action first and quickly becomes covered with bubbles, which must be gently brushed away with a feather, or the fresh acid will be kept from proper contact with the metal and its action retarded. To insure a more uniform attack by nitric acid it is often advisable first to immerse the plate in a bath of Dutch mordant for a few minutes, wash it, and proceed with the nitric bath. More character can sometimes be given to lines bitten with Dutch mordant by immersing the plate in a nitric bath for a short time, just before the desired depth is attained.

Some subjects should be bitten entirely with Dutch mordant, particularly those in which many lines are drawn very close together. Nitric acid would be likely to destroy the little ridges of copper between them and cause what is called a "crevé," of which mention will be made in connection with corrective processes. You may, for instance, have drawn a delicate sky effect, with many fine intermingling lines, with scarcely any ground

visible among them. Even a weak application of a nitric mordant might make a smudge of such work, while either of the other mordants would preserve the minute particles of ground practically intact, if used at a low temperature. Many beautiful sky effects are possible with such needle work and proper biting, and while it may be heresy to attempt to paint with the point, it is usually forgivable if well done.

You can treat such a sky with Dutch mordant, or perchloride of iron, with a view of working on the surface later with charcoal. Some delightful modulations of tone and line are often obtainable if this is skilfully done. Usually, work of this character has to be bitten and covered with a new ground before deeper lines are drawn which are to intersect it. You would find it difficult to use a fine needle across heavily bitten lines as the point would catch and the effect be apparent in the work. It is an advantage, however, to do such work last, when conditions permit, as you are then better able to arrange the masses in more accurate relationship with other units in your composition.

The nitric mordant acts much faster than Dutch, which sometimes requires five or six hours for very deep lines on copper. Perchloride of iron bites very quickly, the lightest lines often being sufficiently bitten in one or two minutes. A deep line bitten with nitric acid has an entirely different character from one which has been exposed to the action of the non-ebullient mordants.

Its edges are broken and quite uneven. This rugged and picturesque quality of line imparts a peculiar charm to some plates which the other mordants would leave without life.

Zinc plates are more susceptible to such line quality than copper, and lend themselves to broad vigorous drawing in a way that inspires their users with a holy ardour.

In biting zinc plates the mordant should be diluted with water to about one fifth the strength used for copper, except in special cases where you want a particularly savage attack made on the metal. Very fine delicate lines are possible on zinc with highly diluted Dutch mordant.

In making up a new mordant you can pour a little of the old into it instead of putting in a small piece of copper, as suggested in the formula. With perchloride of iron, however, neither course is necessary.

The proper temperature for most baths is about 70° Fhr., which would be the probable average temperature of the room. A warm mordant acts much more quickly than a cold one. You can safely accelerate the action of the Dutch mordant up to about 100° Fhr., but beyond this the ground will be imperilled. If there are a great many closely drawn lines in the subject, a much lower temperature is necessary. If, in warm weather, it is not convenient to cool the mordant to a desirable temperature, dilute it with water. The nitric mordant should

not be used at full strength much above 70° or 75° if it can be avoided.

All mordants become weaker with use, and while one which has been used works better than when fresh, biting more uniformly and with greater purity of line, its strength gradually declines until it becomes worthless. You can judge of its condition by its colour. When it gets to a dark green, throw it away.

The non-ebullient mordants deposit a sediment in the lines which gradually retards action in a downward direction. The action of the acid begins on the sides of the lines under the surface, as soon as they become exposed to it. A sectional view of an etched line would look something like the outline of a minute inverted balloon. It is advisable to get the lines to the desired depth with as little corrosion of their sides as possible. The sediment should therefore be removed, or not allowed to form.

It can be removed by gently brushing the lines with a long soft brush in water, which can be allowed to run over it in a small stream from a faucet. This operation should be repeated several times with deep lines. A weak bath of nitric mordant will also remove the sediment.

The deposit of the sediment can be prevented by biting the plate face down, so that it will precipitate into the bath instead of in the lines. Attach small balls of etching ground to the four corners of the plate, to

prevent its contact with the bottom of the tray, and slide the plate edgewise into the bath to avoid possible air bubbles, which might adhere to its surface and obstruct the acid.

A test plate, or "telltale," is of great value in biting. This can be a small strip of copper, large enough to use in making a proof if desired, and prepared for the bath exactly like the plate on which you have made the drawing. Put a lot of point work on it, corresponding in character to the work in the drawing, enough of it so that you can stop out portions of it when you stop out on your plate, and be able to take off parts of its ground for the purpose of examination when desired.

By making a proof of the test plate, or several proofs, during the process of biting the other plate, you will be able to obtain an excellent idea of what has been accomplished, without disturbing your work.

The immersion of the test plate should of course correspond exactly with the other plate, and they must be in the same tray and bath. You can elaborate somewhat in the matter of the test plate by using two or three if you wish to, making memoranda on them with the point at various stages of the biting.

After you have had a fair amount of experience you will be able to ascertain approximately what the acid has done, without the use of the test plate. In special cases, however, it is invaluable.

We will suppose, for illustration, that we are to bite

a copper plate on which the subject is a landscape with large trees and other objects in the foreground. In the middle distance there is an open space and more trees. Beyond these are some hills and distant woods on the horizon. A few clouds float in the sky, some being quite near the horizon and only partially visible through the branches of the trees.

A good way to manage such a subject would be to draw the sky first and bite it, possibly for ten minutes with Dutch mordant.

When the plate is dried the magnifying-glass should reveal a slight depression of the lines. If they are a little too deep they can be reduced with charcoal and turpentine after the plate is cleaned. If they are too light in the proof they can be accentuated with the drypoint. The more distant clouds would probably be a little lighter in value than the nearer ones. With the charcoal or drypoint, or both, you can adjust the desired relation of values.

It is not usually advisable to attempt gradation in biting with Dutch mordant within so small a latitude as ten minutes. It is possible to do it sometimes with good results, but it is better, within such narrow limits, to depend on the corrective measures suggested.

Clean the plate with turpentine and you will see what has been accomplished. The lines will look much smaller than they did on the black ground when the light radiated from them. Now the light radiates from the

bright surface around them and their brilliancy is gone. Do nothing more with these lines at present unless you wish to make a proof.

Reground the plate and smoke it. Draw all the lines which are to be the deepest in the final proof, which would be most of those in the foreground, and immerse the plate in the bath for perhaps two hours.

If, upon examination with the glass, the lines appear nearly as deep as you want them to be when completed, you can next draw the middle distance. Bite both that and the foreground about half an hour, and examine all of the lines again.

If the biting seems to have progressed satisfactorily, put in the distant masses and continue the biting about twenty minutes longer.

It is assumed in this case that the plate is of pure copper, that the temperature of the room and that of the mordant is about 70° Fhr., and that you are using a Dutch mordant which has not been used before.

Even under these conditions the periods suggested for the different stages of biting are entirely tentative. Different plates and mordants of the same composition may act differently. The acid often works with varying intensity during one biting, so the futility of fixed rules is apparent.

You will have to depend on instinct, and the use of the glass, with the general proportions of the different stages of the biting in mind.

In biting this plate it has not been necessary to use stopping-out varnish. We will now bite another of the same subject in a different way.

Draw and bite the sky, as in the first instance, as the branches of the trees which will intersect the lines in it will make it very inconvenient to put the sky in after the branches are bitten.

Reground and smoke the plate. Complete the entire drawing and put the plate into the bath for about twenty minutes. Examine the lines, and if the extreme distance shows satisfactory depth, paint it out with a water-colour brush and stopping-out varnish.

As soon as the varnish is dry enough to resist acid, which will be in about half an hour, re-immerses the plate and bite all of the remaining lines about thirty minutes.

Then, assuming that examination is satisfactory, cover all the lines with varnish, except those in the foreground. When dry, put the plate into the bath and let it remain for two hours.

In each case the foreground has been exposed to the acid two hours and fifty minutes, the middle distance fifty minutes, the extreme distance twenty minutes, and the sky ten minutes.

If the trees or other objects in the foreground are intersected by the lines in the middle distance, and they in turn are intermingled with still lighter ones in the extreme distance, the first method would be preferable.

When the character of the different planes will permit it is better to make the entire drawing, or as much of it as possible, and use the stopping-out varnish as required. You should have your subject and the manner of handling it well matured in your mind before beginning work on the copper, as it is much easier to make erasures, and change the way of expressing your idea on paper, than on the metal. It is well to make a number of studies with a pencil or other medium, with the plan of biting carefully thought out beforehand.

In biting the plate just discussed, you might have decided to leave the foreground to be drawn last, and with the sky and the middle and extreme distances bitten, you could make a proof, reground the plate, and put in the foreground. In doing this you might meet with an unexpected difficulty which, with a little forethought, could have been avoided. The trunks of the big trees in the foreground might overliesome of the other work, and would immediately look as though transparent. In this case the intruding lines would have to be filled, or removed with the scraper and charcoal.

In biting the plate by the first method, in which you began the drawing with the heaviest lines, after laying the ground over the lightly bitten sky, you might discover upon the first examination with the glass that the foreground had been sufficiently bitten and would be overbitten if you proceeded to draw and bite the rest of the subject, with the foreground still exposed to

the acid. In such a case clean the plate and reground it before the rest of the work is added, being careful that all of the lines on the plate are filled with ground. The heavy lines already bitten can be seen distinctly after the new ground is laid and smoked. You will have an opportunity to make a proof, if desired, before the fresh ground is put on, which will be of assistance in the further work. You might wish to add some lines to the foreground at this stage which you would not want to have quite as deeply bitten as those which you have covered up.

You should make a trial proof as often as you feel that it will be of advantage, as you progress with the plate. The proof is the only absolute test you have.

There is a way of getting a certain inequality of depth among lines on the same plane, imparting a variety of line tone, which is often pleasing. This is done by putting a small quantity of nitric mordant on the plate, only enough to cover a small portion of its surface, and moving the edges of the fluid around with a feather, or soft brush, over the places you wish to accentuate. Small areas can sometimes be managed much better by adding saliva to the mordant, which will prevent it from running around too freely.

A convenient way of controlling small quantities of mordant on different parts of the surface is to use a pipette. This is a small glass tube, about a quarter of an inch in diameter, with a point at one end and a rubber

bulb attached to the other, used for filling fountain-pens, and for measuring liquids by the drop. It is also called a "dropper." The mordant can be applied and withdrawn easily and quickly with it, as required.

You will occasionally be able to enhance the effect of deep shadows by regrounding the plate, being careful that all the lines are filled, and overlaying previous work with fresh interspersing lines, which can be bitten either more lightly or more deeply than those already etched. This is frequently effective among masses of branches and foliage, and is often preferable to deepening the first lines. You can in this way add richness to a thinly drawn or insufficiently bitten passage. The new ground must be left unsmoked so that the first work will be distinctly visible. In treating such a passage it is sometimes better to secure the desired depth with the drypoint instead of the acid.

There is another resource which is sometimes of value, but it must be used with discrimination. You may have masses of lines which are deep enough, but lack the breadth required to impart the desired tone to the passage. In such a case, after cleaning the plate, flow over it a thin solution of asphaltum and turpentine. This will fill the lines and protect the smooth surface, but will leave the edges exposed. These will be attacked by the acid and the lines widened without being deepened. The solution must be allowed to dry thoroughly,

with the plate lying perfectly level and face upward, before it is put into the acid.

By adding a little more chloroform, if necessary, the liquid ground will answer the same purpose, and dry in a much shorter time.

In using either solution, follow the directions for applying liquid ground.

Flat biting.—With some subjects it is possible to obtain gradation by using points of different degrees of fineness, and uniformly biting the plate.

A wide line will, of course, carry more ink than a thin one of the same depth. Mr. Zorn says that he often uses this method, and bites with a very weak mordant, sometimes leaving the plate in the bath over night. The different widths and spacing of the lines produce the different values.

Drawing in the bath.—Haden's method of drawing in the bath, which was sometimes used by him in etching from nature, and Hamerton's elaboration of it, in connection with his positive process, have not been considered for the reason that they are impracticable for ordinary use. Drawing in the bath may result in more or less perfect gradation, but the objections to it are manifold. It would require unerring draughtsmanship, and perfect preconception, to attain any degree of success with it.

Notes.—Lay a string across the bottom of the tray, at one end, before immersing the plate. By holding the two ends you can raise it out of the acid so that you can get hold of a corner of it with a rag, and lay it in a tray of water before taking it in your hands. You will probably get your fingers into the acid anyway, but there is no necessity for it. Acid stains on the skin will disappear with the lapse of time.

Do not inhale the fumes of the mordants any more than necessary. They sometimes cause unpleasant irritations of the bronchial and nasal passages. The biting should be done in a well-ventilated room.

Apply ammonia to acid stains on any clothing which you expect to wear in public. The public neither sympathizes nor discriminates.

Rebiting.—If you find on making a proof that the plate is insufficiently bitten, either in whole or in part, it can be regrounded and the lines on it again subjected to the action of the acid. This is a deplorable makeshift, but it sometimes has to be done. Rebitten lines nearly always lose in freshness. The operation can often be avoided, and the vivacity of the lines maintained, by deepening them with a drypoint. This is much the safer way when the character of the work will permit it.

The etching pastes sometimes recommended for use in rebiting do not seem to possess any advantages over

the ordinary ground, applied with the roller, if the work is skilfully done.

There are two ways of preparing the plate for rebiting with the ordinary ground. One is to apply the ground in the usual way, using the dabber. See that all the lines are perfectly filled with it. Do not smoke the surface. Go over the lines which are to be rebitten with a sharp point and remove the ground from them, cutting the metal slightly to insure better contact with the acid. Clean out only the lines which are to be rebitten the most, bite them, and proceed with the other lines in their order.

The other way is to maintain a gentle heat under the plate, just enough to enable it to take the ground easily from the roller. Melt the ground on another warm plate and charge the roller thinly and evenly with it. Roll the ground upon the plate to be rebitten, in all directions, with a light and even pressure. With care this can be done in such a way that the smooth surface is entirely covered and all but the very light lines left open. These if necessary can be gone over with the point and cleaned out.

After the operation is completed the heat should be increased slightly so that the surface of the ground will become smooth, but not enough to melt it into the lines.

The best way to do this is to put the plate into a hand-vise, reverse it above the heat, and afterwards let it cool face upward. This must be cautiously and

delicately done or the ground will get into the lines. Go over them carefully with the glass before putting the plate into the bath, and see that no ground is retained by any of the lines that you wish attacked; also be sure that all of the smooth copper is perfectly protected.

If there are any depressions on the surface of the plate, you will have to use the dabber instead of the roller.

Dab the ground rather thinly over the spare plate. Clean the dabber with a rag and gently dab the ground from one surface to the other, applying but little of it at a time, until the proper covering is attained on the plate to be rebitten. Exactly the right amount of heat must be maintained under both plates to insure success. See that the surface of the ground is solidified, as you would if the roller had been used instead of the dabber.

When the new ground has been successfully laid, proceed as you would with a first biting—successively stopping out lines as they attain sufficient depth.

The plate and the lines on it must be cleaned perfectly, without the use of whiting, before you commence. Use an old tooth-brush and turpentine, rubbing it well into the lines. Afterwards use the brush with soap and water, rinse the plate and dry it. This is to remove any traces of foreign matter which the rough surfaces in the lines are likely to retain, especially if you have taken proofs during the progress of the work, which might interfere with the attack of the acid. A lump of fresh

Study of Willows
Etched by the Author

Study of Willows
Etched by the Author

bread may be used for the final cleaning instead of soap and water.

Trial proofs.—When the plate has been cleaned with kerosene or turpentine, the biting having apparently been completed, make two proofs. For the first one wipe the plate as clean as possible with the rag and afterwards with the side of the palm of the hand charged with a little whiting. Be sure that none of the ink is removed from the lines. This proof will look cold and hard, but it will show the actual state of the lines.

In making the other proof, carefully treat the surface with rags and *retroussage*, the directions for the use of which will be found under the head of printing, with a view of ascertaining the printing possibilities of the plate in its present state.

Japan vellum had better be used for these proofs, as it will more accurately indicate the condition and possibilities of the plate than almost any other paper.

Bevelling.—If the edges of the plate were not bevelled when purchased, this should be attended to. The bevel is necessary to enable the roller of the press to mount the plate properly, in printing, without pulling or injuring the paper. It also furnishes an agreeable plate mark to the proof, which is of great importance.

Much of the charm of an otherwise beautiful impression can be destroyed by slovenly and neglected

edges. If the rules of good composition have been followed in your drawing, there is one spot in it to which everything else is more or less tributary—a point on which the eye naturally and unconsciously falls at almost the first glance. Care should be taken that the eye is not led to the edge of the proof, or diverted in any way from the harmony of the effect which you have striven to obtain. Parenthetically, it may be said that the same rule should be considered in respect to frames. A frame which in any way attracts the eye from the composition should never be put on a picture of any kind, to say nothing of an arrangement of delicate lines, which must suffer if surrounded by anything which is not neutral and harmonious in character. The plate mark has, to some extent, the effect of a frame. It should be delicately unobtrusive, and at the same time adapt the plate to printing requirements.

The bevel should be at least 45° , and a lower angle from the surface of the plate is better, particularly if the copper is thicker than eighteen gauge. The bevelling can be done with a coarse file to the desired angle, followed by a fine file to obtain a rather smooth surface. Pumice-stone will make it still smoother. After that go over it thoroughly with charcoal, and finish with the burnisher.

Cutting plates.—When you have occasion to alter the size of a plate, draw a line with a pencil, or sharp point,

and a T-square, where the cutting is to be done. Lay the plate on an iron surface, and cut along the line with a hammer and cold chisel, evenly and gradually, until you have cut the copper about half through. Clamp the part which is to come off into a bench-vise, and work the plate back and forth, until it is detached.

The excess copper can also be sawed off with a metal saw.

The edge can then be bevelled, and the roughness removed from the back of the plate.

CHAPTER IV

CORRECTIONS AND ADDITIONS

WE will suppose that a number of accidents have happened, and that several errors and miscalculations have been made during the progress of the work, necessitating the use of the corrective methods now to be described.

Alterations on the surface must be made cautiously and the affected passages treated in a neat and workmanlike manner, so that no traces of the means used will be apparent in the proof. Any evidence of work of this kind will detract from the freshness and spontaneity of your etching.

The first question to be decided is, of course, whether or not it will be more advantageous to make the necessary alterations and corrections or to re-etch the subject on a new plate.

As a general rule it is better to persevere with the original plate until all hope of saving it is gone. Copper is a wonderful metal, and with the resources at your command you will usually be able finally to obtain a satisfactory proof. A well-known etcher has truthfully

said that "while there is copper there is hope," and were it not for the mechanical obstacles, and the inevitable mistakes and discouragements, achievement would lose much of its value.

You will find that a great deal of correction can be made with the drypoint. Few finished plates ever go under the roller of the press without more or less drypoint work on them.

After drypoint, the main resource in correction is charcoal, which you will use constantly. The scraper and burnisher come next. You will not have much use for the burin, but it is often utilized for deepening heavy lines, which require only a little alteration, and connecting broken lines.

Reversed proof.—In making corrections on the plate you will find a reversed proof convenient. Lay a sheet of moist paper over a freshly pulled trial proof. Adjust the press so as to obtain a good pressure in the absence of the plate. Lay the blankets over the moist paper, and pass the proof once under the roller. Upon separating the sheets you will have a duplicate of the drawing, as it appears on the plate.

Removing lines.—The usual way of removing light lines from the surface is to erase them with charcoal and oil or turpentine. If they are too deep to be easily handled with charcoal the surface must be reduced with

pumice-stone or the scraper. See that the edges of the tool are very sharp, as a dull scraper is a nuisance.

Do not try to get too much copper off at once by cutting too deeply at each stroke or little ridges will be left in the metal which will be difficult to efface later. Hold the blade quite flat, at an angle of about 45° in the direction of the stroke. Remove the copper gradually and equally from the surface, until the bitten work is effaced. Finish the scraped surface with charcoal and turpentine, and finally with the felt block and finely powdered pumice-stone.

Only small areas should be treated with the scraper. The depression left should be taken out if it is deep enough to affect the printing qualities of the plate. Locate the corresponding area of the depression on the back of the plate with a pair of callipers, and scratch it over with a sharp point. This area can also be located by means of four fine rubber bands. Stretch two of them lengthwise around the plate and two across it. Adjust them so that they will cross each other in a way that will approximately enclose the margins of the depression, and mark the corresponding area on the back.

Reverse the plate on a small anvil with a polished surface, or on a thick blotter laid over a smooth board. With a hammer and nail punch apply light blows, constantly changing the position of the point of the nail punch, until the equality of the surface on the face

is restored. A small hammer with a rounded end will answer the same purpose, but the nail punch is better. If portions of the restored surface are too high, indicating that you have pounded a little too hard in spots, they can be treated with the scraper and charcoal again.

After much experiment I have found another way of getting rid of very deep lines which is effective and saves a great deal of labour and time. Instead of being scraped away they can be filled up with solder or copper amalgam.

Filling with solder.—A small inexpensive soldering outfit can be obtained at the hardware store with full directions for use. The solder sold with it is likely to be too soft. It is the kind ordinarily used for common repair work, consisting of one part tin and two parts lead. You will need a small stick of the kind used by electricians, which contains two parts of tin to one of lead.

The lines to be soldered must be chemically clean. After a thorough application of turpentine with a stiff brush, wash them out well with carbonate of soda, or lye, and afterwards with a brush and soap and water. To be sure of perfect contact with the copper in the lines go through them several times with a sharp point, tear up and expose the metal. Then lightly dust them with finely powdered rosin, or go through them with

a small water-colour brush which has been dipped in muriatic acid.

The muriatic acid must have been previously prepared by putting a small quantity of zinc filings into it. This—to use the tinner's phrase—"cuts the acid." A small bottle of this can be kept on hand. The plate can then be laid over a Bunsen burner and heated. When it is hot enough to melt the solder, rub the end of the stick along the lines. With the hot iron, which can also be heated with the Bunsen burner, rub the excess solder smoothly around on the surface, being sure that the lines are completely filled.

Cool the plate and remove the excess solder with the scraper. It is much softer than the copper and will come away easily. When it is practically all gone, and the filled lines show clearly, use charcoal and turpentine until a smooth even surface is attained.

While the solder is comparatively soft, it is hard enough to withstand any pressure which the plate is liable to receive, and to take a fair polish.

If it be more convenient to do so, take the plate and stick of solder to a tinner. The solder he will probably have will not be as hard as it should be. Prepare the space to be treated as directed, and he can assist you. The heat under the plate is essential. If applied from the top of the solder with an iron, a perfect result is not so certain, although the solder should be manipulated with the iron after it has melted on the plate.

The melting point of solder, consisting of two parts of tin and one of lead, is 340° Fhr. I have experimented with harder solders, but it is not advisable to subject the plate to the higher degrees of heat required to melt them. When great heat is applied to one spot the plate will bulge, owing to the unequal expansion of the metal.

A solder consisting of the ingredients named is sufficiently hard for the purpose. Copper amalgam, directions for the use of which will follow, is applied cold. It is harder than the solder, but quite brittle. The ductility of the solder will enable one to use it in a way that will be suggested in connection with the reduction of overbitten passages.

If the obliterated lines are crossed by other lines, which we wish to save, they can be cleaned out at the intersecting points with a drypoint, but the solder edge is of course not as hard as the copper. It will withstand all necessary direct pressure, when protected by the walls of the line, but it is not hard enough to sustain continued wear on its unprotected edges.

Filling with copper amalgam.—Copper amalgam can be obtained from a dental supply house, or from a dentist, although it is now seldom used for filling teeth. It comes in little square or diamond-shaped lumps, and costs about a dollar an ounce. An ounce will last a long time. It usually consists of three parts of copper and seven of mercury.

Place two or more pieces in a small iron spoon, and hold it over a spirit lamp until the heat drives the globules of mercury to the surface. Quickly place it in a small mortar and rub it briskly with the pestle. When the mixture is perfectly smooth, remove it from the mortar with the spoon, roll it up in a ball and knead it in the palm of your hand with your finger until it is soft and spongy. When it is ready for use the kneading will produce a crackling sound, and the mass will retain a good impression of the end of the finger. Rub it well into and over the line. Take a burnisher and rub the amalgam, with short circular movements, around over the line until satisfied that it is packed full. A small excess can be allowed to remain on the surface as the scraper will easily remove it after hardening. This will require about twenty-four hours. Finish the surface by gently scraping away the excess amalgam. Then use charcoal and turpentine until a satisfactory polish is obtained.

Amalgam requires anchorage. This is usually provided for by the slight cavities in the sides of the line, under its surface, where the acid has attacked the copper during the biting. It is well to accentuate these cavities, when possible, by running a sharp point along under the edges to insure a more perfect retention of the amalgam.

When the amalgam has set, it is very hard and brittle. It is easily removed from a line with a point, with which it can be broken away in small sections, but, like the

solder, it will stand any necessary pressure from above when protected by the line walls.

I have etched new lines over old ones which have been filled with amalgam, but I am not prepared to say how long such lines will wear in printing as compared to those etched on pure copper.

Small circular iron spoons with long handles are sold by the dentists' supply houses for use with amalgams, as are the mortars and pestles especially adapted to the purpose. When you heat the amalgam, previous to kneading it, be careful not to get it too hot, or the mercury will be entirely cooked out of it and you will have a sandy mixture in the mortar. Put it in the mortar as soon as it is covered with the small globules.

Never overheat the plate after amalgam has been used on it. The ordinary heating, sometimes necessary in printing, will do no harm, but do not get it hotter than would be required to melt etching ground.

Reducing overbitten passages.—If the lines are not very deeply bitten you can usually reduce them sufficiently with the burnisher, invaluable for this purpose. It should be used with oil. You will sometimes find it convenient to overbite some passages, deliberately, with the view of treating them later with the burnisher. Very delicate gradations can sometimes be obtained with it. Use it rather flat, as the point may make small depressions in the copper which are sometimes very irritating

when the plate is inked. Do not use the burnisher on heavy lines, as it will round the edges.

The next resource is charcoal and turpentine. If the lines are too deep for reduction with the burnisher or charcoal, or both, use the scraper first and finish with charcoal.

A lump of pumice-stone, used with water or turpentine, is very effective when the surface to be reduced is too large for the scraper. It leaves a rough surface, which can be treated with charcoal, and finally finished with the felt block and pumice-stone powder.

Very deep lines can be soldered up entirely, and the solder partially removed afterwards with the burin or point, leaving the line at the desired depth.

Foul biting.—This usually comes from carelessness. The ground may be slightly burnt in some unsuspected spot and the acid, not being discriminative, has been just as active there as it has on the rest of the plate. With a non-ebullient mordant, little holes in the ground are sometimes very hard to detect, but with nitric acid they can be seen. In such a case remove the plate and protect the spot with varnish as soon as possible. Follow the same rules with foul biting as in removing any bitten work from the surface. Solder or amalgam will take good care of the holes if they are deep. If they are shallow the ordinary methods will suffice. Some etchers occasionally resort to "foul biting" intentionally

with a view of obtaining a particular effect with it. In such a case it ceases to be foul biting and becomes a part of the method, questionable though it may be. Sometimes excellent results can be attained with it. Surfaces to which you wish to impart a feeling of artistic disorder and general dilapidation can be treated in this way.

After the drawing is completed the ground can be slightly broken with the end of a small stiff brush, with the end of your finger, the broken end of a stick of charcoal, or by any other means that may suggest itself, wherever you want the "foul biting" to occur. A small piece of sandpaper, fine or coarse as may be desired, can be placed over the area to be treated, and pressure applied to it with the end of the burnisher, until the ground is broken to the desired extent.

Another way is to apply etching ground or varnish unequally to the clean plate with a dabber, protecting with varnish the parts of the surface which you do not want the acid to attack, and bite it to the depth desired.

Much discrimination should be used in allowing foul biting of any kind to remain on the plate, either accidentally or intentionally. Unless it happens to be in precisely the right place, it is likely to convey an impression of poor craftsmanship and slovenly methods, but, like some other sins, it will be forgiven if successful.

The crevé.—By common consent, several French terms, used in connection with etching, have crept into

our language for the reason that they seem to be more expressive than any English words that could be substituted for them.

When the ridges of copper between close and intersecting lines are destroyed by the acid, a flat space results which refuses to hold the ink in printing. A grey spot appears in the proof, the rag having taken the greater part of the ink out of the shallow depression. Instead of getting a rich deep black where it was most needed, you have obtained an unsightly and repulsive blotch. This is called a *crevé*.

Usually the offensive passage can be corrected with the drypoint, leaving the burr in the hollow. In some cases it will be better to hammer up the plate from the back and re-etch the passage. The burin can also be used effectively, care being taken that the character of the cutting harmonizes with the surrounding work.

Tints.—There are various ways of tinting portions of the surface of the plate to support the lines and to obtain particular effects. Such work is usually very transitory, and must be renewed several times if a large number of impressions are made from the plate. The friction on the plate, necessary in printing, soon wears it away. It is advisable not to depend on it as a method for general use. It is sometimes of value in delicate skies, and can, if strong enough, be protected by steel facing. The effect is likely to be muddy.

Acid tints.—After thoroughly cleaning the plate with turpentine, and soap and water, pure nitric acid can be applied to it with a brush, using it as you would water colour. Have a tray of water at hand so that the action can be stopped instantly at any time. The nitric mordant can be used in the same way. Judicious use of the brush will produce various gradations as required. The tint can be treated with charcoal to any desired extent after it has been put on.

Sandpaper.—A small piece of sandpaper can be attached to the flat end of the stick, and by lightly tapping it with a hammer, moving it around over the space to be tinted, it will sometimes be possible to get a desirable effect. Such work would be less likely to appear muddy in the proof than if the sandpaper was rubbed on the surface.

You can also obtain a tint with sandpaper by laying it on the plate and putting it through the press. This can be done with the bare plate or over a ground. If a grounded plate is used, portions of the surface can be protected with varnish as desired, and the part needing the tint slightly bitten.

Sulphur tints.—Under some conditions, a paste, composed of oil and sulphur, applied with a brush, will produce a delicate soft tint. The sulphur will cause the surface to turn dark, but the corrosion is very slight.

Tinting with the roulette.—Portions of the subject can frequently be effectively treated with this tool, particularly in deep shadows. The result is much like mezzotint. Work of this kind should not be obtrusive, but you will find many occasions for it. It should only be used locally, as a support for lines and passages requiring greater softness and mystery.

Preparing the plate for the press.—The varnish which was applied to protect the back of the plate from the acid must all be removed. Cover it with kerosene and heat it, after which it can easily be taken off with a rag saturated with more kerosene. If the varnish is allowed to remain on the back it will be a constant nuisance.

If corrections or alterations of any kind have been made on the surface there will probably be inequalities in the polish, which will show on the proof. The polish should be made uniform, and the texture put on the surface which you want it to have when the proofs are made.

The texture on the surface is quite important. The "mirror finish" which is usually on a new plate is intolerable, and it has probably disappeared during the progress of the work.

Except in a few special cases where you might wish to avail yourself of a particular texture on some portion of the surface, or on all of it, the best finish will be that

obtained by the use of the pumice-stone powder and the felt block. Many muddy-looking impressions are attributable to attempts to retain a printing texture which will impart a strong general tone to the proof. Unless it is very skilfully done it is always a failure. When a good working surface is obtained on the copper, the matter of a tint had better be left to a judicious use of the ink in wiping.

The light which reflects from the paper where there is absolutely no ink imparts the life and vibrant quality to the impression. Light may come from comparatively minute points through a texture on the plate, but it must be there or the tint will be a smudge.

The power of a surface to reflect light should be the complement of its power to absorb it. The ink is the complement of the white spaces, and clarity and luminosity are essential.

CHAPTER V

DRYPOINT AND SOFT-GROUND ETCHING

THE meaning of the word etching has been gradually broadened so that it now includes drypoint work and impressions from plates which have been executed in that medium, although the process does not involve the use of acid.

The necessary tools have been described in connection with materials. Drypoint work is really free-hand engraving. The lines are cut into the bare metal with a sharp steel or diamond point, which raises a burr. The instrument ploughs the surface and leaves furrows of copper on one side or the other of the incised line, or on both sides, according to the angle at which the stroke is made. This furrow, or burr, is a vital factor in printing. The ink catches in it to a greater or less degree according to the character of the wiping and the amount of burr left on the plate.

The effects of the burr are varied by the use of the scraper, more or less of it being removed, as may be required to attain the desired effect of the line. Sometimes all of the burr is scraped away, leaving a V-shaped

line in the copper. Such a line has an entirely different character from one bitten with acid. It is more like a line cut with a burin, its edges being cleaner and sharper than the bitten line.

Drypoint is an almost inseparable auxiliary to bitten work, and as a corrective medium it is indispensable. One writer has said that "drypoint is to an etching exactly what glazing is to an oil picture: it gently darkens and softens the work, and throws over it a veil of a different quality from its own."

As an original process, it is capable of great subtlety of expression and poetic interpretative power. The burr imparts to the printed line a mysteriously rich and picturesque quality which is possible in no other medium.

The burr disappears with continued wiping of the plate and the pressure of the roller in printing, and the life of a plate, the artistic quality of which depends upon this burr, is extremely limited. It will sometimes show deterioration after three or four impressions, and after fifteen or twenty its "mantle of beauty" is gone.

A drypoint plate can be executed with a view of having it steel faced. This process partially fills the most delicate lines, and by calculating on this you will be enabled to utilize steel facing to better advantage. The very lightest lines can be made a little heavier, so that steel facing will bring them to about the intended value, but some experience will be required to enable

you to do this with any degree of certainty. The difference is really slight, but it must be considered.

It will be useless to attempt drypoint work unless the points and scraper are very sharp. The oil stone must be used constantly.

If the point is held upright the depth of the line will be less, in proportion to the amount of pressure used, than if it is held at an angle, and the burr will be thrown up equally on both sides. When the stroke is made at an angle, the most of the burr appears on the opposite side of the line. A diamond point cuts a sharper and cleaner line than steel, with much less burr. The amount of burr depends on the inclination of the point and the amount of pressure applied. The point should usually be held at about the angle that you would naturally hold a lead pencil.

You can begin the drawing on the bare plate, or you can ground and smoke it, which will enable you to sketch the subject lightly on the surface before attacking the copper with the sharp point. It is often practicable to do the greater part of the drawing on the grounded plate with an ordinary point, and bite it slightly before using the sharp point. Many plates which have the appearance of having been done entirely in drypoint are handled in this way.

It is best to begin with the lines from which you expect to remove the burr, if it is to be left on the heavier and deeper lines to be drawn over them, as the later

lines will interfere with the use of the scraper on the first work. In removing the burr, the scraper should be held nearly flat on the surface, and the strokes made in the direction of the lines as nearly as possible. If the blade is held parallel to a line it will not cut as well, and will be likely to push the burr down into the line, instead of taking it off. The scraper should be applied with a slight drawing movement against the burr, as you would cut with a knife, and not pushed straight against it, if you wish to cut it completely and cleanly away. You will soon learn just how to do this effectively.

For very deep lines use the flat-sided points, after cutting lightly with the round point. The flat point has a trick of running off by itself under strong pressure, if it is not well guided. Do not cut deep isolated lines in a foreground containing heavy bitten lines, as they will not harmonize with them. While drypoint and bitten lines harmonize beautifully in a general way, discrimination must be used in combining them, as it is possible to carry it too far.

Effective half-tones can sometimes be obtained with judicious use of the scraper on the bare surface among the lines. Local tones can be put on in this way and the lines cut afterward.

With a long fine point delicate passages can be worked over many times, with light strokes. The burr may be removed from the first series of lines and left on the later work. Lightly bitten skies are effectively

handled in this way. If such surfaces are manipulated with charcoal, the burr will of course disappear, and it is frequently desirable that it should.

You can often save an apparently hopeless bitten plate by going all over it with the drypoint, allowing the first work to be merely a basis for the second.

The roulette will be found of value in drypoint work, and particular passages can often be treated effectively with it.

By rubbing a mixture of tallow and lampblack into the incised lines, and wiping the plate with the side of the palm of your hand, as you would in printing, you can see the effect of the work. A tube of black oil color is convenient to have at hand for this purpose. It can be carried in the pocket tool case.

SOFT-GROUND ETCHING

Some eminent writers, whom we are accustomed to accept as authority on almost any question relating to etching, condemn the soft-ground process altogether, as being a mere imitation of lithography. Others mention it in a seemingly apologetic sort of way and dismiss the subject, after giving a brief description of how soft-ground etching is done.

In competent hands this method has wonderful capabilities and requires no defence. Like any other medium, it must be properly used and not regarded as a

plaything. It resembles lithography only to the extent that its line has a grain. A plate executed by this method can be printed in as many different ways, and with as great a variety of effect, as if the drawing and biting had been done in the ordinary manner.

It is especially adapted to some subjects, and to one who is accustomed to expression with the lead pencil or charcoal, it opens an alluring field.

The invention of the process is attributed to Dietrich Meyer, a Swiss painter (1572-1658). Until recent years the art has been practiced only in a comparatively limited way, but lately there has been a revival and we are beginning to see some splendid impressions in this medium. It is well worth consideration.

The German etchers have done some excellent work in soft ground, notably Dr. Otto Gampert of Munich who used it as a tone process, practically ignoring it as a line medium. He attained results with it very similar to those of charcoal. Many fine soft-ground plates are now being produced in Europe and America.

The following extracts are from a magazine article, by Dr. Hans W. Singer, which appeared several years ago, in which the writer quoted some observations on soft-ground etching by a prominent English etcher:

I claim for it a position between that of mezzotint engraving on the one hand and etching on the other. Unfortunately, at the present day the public cannot, or will not, see the qualities of this art. Even the etchers themselves

(except a few) understand little but the pure line. . . . The quality of line that you get with soft ground, is peculiarly that of softness and richness, as opposed to the more wiry line of ordinary etching. It is not unlike the lithographic line, only in lithography it is difficult, if not impossible, to get strength without blackness. . . . Its chief charm is its suggestiveness, so that if all the more delicate gradations of tone *could* be got, it is a question whether it would be desirable. . . . Where I have found soft ground of most use is, I think, in doing skies. . . . It is as a compromise between etching and mezzotint that soft ground steps in; it gives some of the qualities of both, but at the same time with a charm of its own, which neither etching nor mezzotint has.

By the word "etching" in the foregoing extracts, the writer of course means work done by the ordinary methods, as distinguished from soft-ground etching. The same principles apply in biting a plate executed in either medium.

Ground and smoke the plate exactly as you would in the regular process, using the dabber and a ball of soft ground.

Every precaution must be taken to protect the surface from abrasion, as it is much more delicate than the harder grounds.

Secure the grounded plate to a drawing-board with large thumb tacks and stretch over it a sheet of thin unglazed paper with a grain. The thumb tacks along the upper edge of the plate can also hold the paper.

The paper used should have a rather fine, even,

broken grain, and be free from water lines or marks. Some of the white tracing papers do very well. A very thin "linen finish" bond paper is well adapted to large plates and broad effects. A firm white tissue paper can also be used. The paper must be thin enough to permit the pencil strokes to be distinctly defined on the ground under them, and there must be enough grain in the paper to leave minute particles of ground in the lines when the paper is removed. A smooth or thick paper will not work. The paper must be strong enough to enable you to work freely on it without tearing its surface.

Attach the lower right side of the paper to the board with a thumb tack which does not touch the plate. See that the paper lies securely and smoothly. Mark a line, with the side of the point of a pencil, on the paper along the edges of the plate, so that you may know just where the edges are under the paper when you have occasion to remove and replace the plate. You will also need this line when you are making your drawing, if the paper is not sufficiently transparent to enable you to see the edges of the plate through it.

Use a finely pointed "6 H" pencil for the finest lines. The fine point can be maintained by means of sandpaper or a small file. For the broader and softer lines you can use a "2 H" or even softer pencil.

The pressure must be sufficient to cause the ground under the point to adhere well to the paper. By remov-

ing the lower thumb tack you can raise the paper occasionally, observe the progress of the work, and after replacing it, accentuate any lines that need it.

Your drawing can be sketched in red ink on the paper before you stretch it over the plate, if desired, without interfering with the pencil work. If you do this you must use a paper that will carry the ink. Tissue and the other soft surface papers absorb it. The white tracing papers used by mechanical draughtsmen will do very well.

Bite the plate exactly as you would if you had made the drawing directly on the ground with a steel point, except that you must not use the nitric mordant. The Dutch mordant at a temperature of less than 70° Fhr. is much better, as it will not tear out the small particles of ground which the grain of the paper has left in the lines.

Delicate flat tones can be produced by using the sides of your pencil points on the paper; and afterwards treating them carefully with a water-colour brush and stopping out varnish at various stages of the biting. Skies can be very effectively handled in this way, and with practice you will find that you can produce effects very much like those of pencil or charcoal work on paper.

If the weather is warm, use a ground containing only a quarter or a third of its weight of tallow instead of half, as mentioned in the formula. The ground must

be protected from pressure by the hand in drawing. A hand rest can be easily arranged so that your hand can be quite close to the plate without danger of pressure on the paper.

Warmth from the hand or from any other source will cause trouble, and at no time should the plate be subjected to any more heat than is absolutely necessary. If it gets quite warm, the tallow may separate slightly from the ground and cover the lines with an invisible film which will prevent action by the acid. If you are working out-of-doors in the summer, keep the plate in the shade.

The plate can be removed for successive bitings, cleaned, and regrounded for further work; in fact you have practically all the latitude in manipulation that you would have if using the ordinary method. The only mechanical difference is that you are using a softer ground, and the drawing has been put on the surface in a different way.

Before putting the plate into the bath, examine the entire surface very carefully with the glass. You will probably find small abrasions in the ground which all your precautions have failed to prevent. These must be taken care of with the varnish.

In retouching the plate after the paper has been removed, the work must be of such a character as will harmonize with the grain already in the lines. You can stipple with the point where you wish to accent a

line or passage, or you can use a drypoint on the bitten surface in the same way. You will nearly always find use for the drypoint in finishing the plate.

Much mystery and charm can be added to the bitten plate by the skilful use of the roulette. Its grain will perfectly harmonize with that left by the paper, and you will probably find several passages in your subject where it will be of remarkable utility.

It is possible with some subjects to use pure line work effectively in combination with soft ground, but you must do it especially well if you are to be pardoned for it. You can produce grained masses on the ground through the paper which you can afterwards treat with a brush and varnish, and successive bitings, much as you would an aquatint.

If you take up the study of soft-ground etching seriously you will find in it a splendid range for individual expression.

CHAPTER VI

PRINTING

NEARLY every etcher of experience has his own ideas as to the best way to handle the materials involved in the printing of an etching. If it is possible to obtain instruction from a practical printer of etchings, do so, as you will learn more in an hour than you probably could by reading many chapters on the subject. You cannot ask questions of a printed page.

After you have learned what the practical printer can teach you, you will probably find, upon consulting another, that at least a part of what has been told you is very faulty. A third may tell you that practically all that you have been taught by the other two is rank heresy.

The proper printing of an etching is an art in itself and is a medium of expression. Every plate will present its own problems. It is essential that you do your own printing, or that it be done under your immediate supervision, if you expect to get out of your plates what you have put into them. In working with your own plate, different ways of treating it will occur to you as you

proceed, and you will often hit upon a fortunate variation in the manner of manipulating it, an advantage which you will not have if you delegate the work to somebody else.

If you send a perfectly satisfactory proof to an expert printer, he should be able to make as many duplicates as required, but you will usually find, upon examining the impressions, that they are not exactly as you would like to have them. If you are not in a position to do your own printing, or even a part of it, you will necessarily have to have recourse to the professional printer, but do the work yourself if possible.

After you have had considerable experience you will naturally fall into your own way of managing your plates. Your own plate is your best teacher.

There is little rag work necessary on a plate that the expert use of soft cheesecloth and mosquito netting will not accomplish. The greater part of the rest of the work is done with the side of the palm of your hand. It is always more or less charged with ink while you are at work. By lightly touching with it a small pile of whiting, you can obtain, with a stroke on your canvas apron, a surface on the mixture on your hand, which, with the right kind of side strokes, will clean the face of the plate completely. As your hand takes up the ink on the plate, repeat the applications of the whiting and the strokes across your apron as often as necessary.

A proof taken after such wiping will be harsh, cold, and expressionless, without *retroussage*, but it will show the actual condition of the lines.

There is a trick in wiping clean in this way which you will soon learn. The movement on the cloth, which drives the whiting into the inked surface on your hand, is the same as you use on the plate. It is a quick side flip. If you are wearing a pair of old trousers, the side of the right leg is much better for the purpose. Mention of the use of the apron is intended for those who, for special reasons, may not find it convenient to avail themselves of the last suggestion. After repeated use the cloth surface used will become caked over with dry ink, which will make it much better. Hand wiping is of course done after the plate has been wiped nearly clean with the netting.

Ink on the hand, mixed with whiting, just to the right degree, and applied with a different and more gentle movement, is a most valuable means of obtaining delicate tones on the plate. Subtle, filmy local tints left on the surface in this way are full of life, and often impart much atmosphere and variety to the proof. The treatment can be applied with the ball of the palm at the base of the little finger, or with the side of the palm as required. It must be done in the most delicate and tender way—barely touching the copper—and with just the right movement, or you will get an excess of ink on the surface. The tone will adhere more or less

as desired. Special passages, or all of the lines, can be beautifully supported by such manipulation.

Wiping with the hand, either clean or with a tint, leaves the lines full of ink, and with *retroussage* a stronger and more brilliant effect can be obtained than if the rag tint is left on the plate. The rag tint modifies the lights and darks, decreases their contrasts, and gives a softer impression.

Different temperatures, and therefore different degrees in consistency of ink, during the process of inking and wiping the plate, are an important factor in skilful printing. Much subtle and refined treatment is often possible with a warm rag on a cold inked surface. After the lines are filled with warm ink, the plate should be allowed to cool before the rag work gets to a point where it is likely to remove any of the ink from them. The use of the warm rag will soften the surface ink, more or less, as desired.

In finishing a rag wipe, the netting can be used in a way that will leave more tone on some parts of the surface than on others. A tone left by it is more luminous than one left by a soft rag, as the rough surfaces of the threads in the fabric minutely bare the copper and prevent muddiness.

If there is an ink tint on the plate, against which you want a small accent of strong light, the burnt end of a match will clean the spot perfectly.

A plate which has been executed in drypoint presents

different problems from one which has been bitten. The burr on a line will catch more ink when the wiping is done from one direction, than from another. After the plate has been rag-wiped, the effects of the burr are enhanced by wiping the surface more or less clean with the hand, the movements being made in the directions which seem to be the most advantageous. The strokes of the hand sweep the surface ink into and against the burred lines, leaving them full and rich. Subsequent manipulation with *retroussage* can be added at discretion.

The great advantage of mosquito netting, for general use on the plate, is that its stiffness prevents it from getting into the lines. Its open texture gathers the ink well, and it is sufficiently pliable for convenient handling. Use the white netting. It will not stay white, but you can always see the amount of ink it is carrying, which would be difficult with black netting.

The beginner is earnestly advised not to attempt much artificial printing at first. It is only in particular instances that more than a little of it is of value in the proof. There is always a temptation to juggle with the tints, but after years of experience you will probably find yourself relying upon comparatively simple and direct methods. It is skill in using these which should be developed, instead of a tendency to complicate and elaborate them.

Artificial printing, within certain limits, offers a

fertile field for artistic ingenuity, but these limits are soon reached. It is quite legitimate up to a particular point, which it would be very hard to define, except to say that line expression should not be overbalanced by it, as is usually done in colour printing. When this point is reached, some other medium would be more appropriate for the subject. There is a striking contrast between a plate which has been wiped completely clean, and one on which the lines and spaces have been enveloped in a mantle of delicate tonality by tender and sympathetic artistic treatment, but it must not be overdone.

Some etchers emphatically object to artificial printing, maintaining that the work should all be on the plate, before the application of the ink, and that special treatment should never be required, but this is a matter of individual opinion. You may be accused of making a monotype over your etched lines, but if it is a good monotype, little more can be said. Print your plates in your own way after you get started, and if your work is well done, you will be safe, as far as intelligent criticism is concerned.

The proof, and not the plate, is the final utterance, and whatever merit your work may have should be apparent on it.

Retroussage.—This is another commonly accepted French term, for which there is no satisfactory English substitute.

The process consists of treating the inked lines with a soft rag so that the ink is delicately raised and slightly blurred over the edges, imparting a deep, rich, soft quality, which is impossible by any other method.

The best way to do this is to pad up loosely a good-sized piece of clean, soft unbleached cheese cloth, the bulk of which should be about the size of your closed hand. A portion of the cloth should lie rather evenly around the whole mass. Gather one end of it in your fingers, so that just the weight of the rag will fall on the copper in front of your hand. Warm it if necessary. Then draw it around on the surface with a delicate "wiggly" movement. The nap of the fabric will pull up the ink and distribute it slightly on the edges of the lines. The application of the rag must be made in a tender and caressing way. It is easily overdone.

Another way of getting the ink over the edges of the lines is to finish the wiping with a certain rapid movement, with netting or tarlatan, across the plate, using more or less pressure, as may be needed. The consistency of the ink in the lines has much to do with the success of the operation, and you will have to experiment with the method until you can do it exactly right. When it is successful it imparts a peculiar soft cloudy quality to the lines, which is different from the effect of the soft rag.

Delightful results are sometimes obtainable with the brush, which has been described in connection with

the materials for use in *retroussage*. It must be used in such a way that the grain over the lines, or through a tint runs in the right direction. Effects of shadows and of reflections on water can be skilfully enhanced by it. It must be used with the greatest discrimination, and care must be taken that the effect left by it is translucent and not smudgy. Where many very fine lines are close together, the brush will often do better work than the rag, as it will not remove as much ink from them.

Much brilliancy is added to a hand-wiped plate by *retroussage*, on which more or less of it is almost invariably a necessity. When it is used at all it must be applied in a greater or less degree to the entire plate; otherwise the effect will be discordant.

Very delicate results can be obtained on drypoint plates with the process. The rag softens and enriches the effects of the burr surprisingly.

Retroussage develops the sympathetic and picturesque qualities of the plate and imparts a feeling of depth and mystery to the proof. It is one of the etcher's most valuable resources.

The work should be done when the plate is otherwise ready for the press, with the exception of the cleaning necessary on the edges.

Preparing the ink.—The ink which you buy should be thoroughly worked up with a palette knife until it is of precisely the right consistency. Ink which has stood

for some time is not in a condition for immediate use. If oil is added, it must be worked in until the ink is perfectly smooth. The consistency is very important, as it cannot be readily removed from the surface of the plate if too stiff. If too thin the rag will take it out of the lines.

A little experience will enable you to adapt the consistency to your plate. Various inks and consistencies are necessary with different plates and different ways of treating the surface in printing.

Preparing the paper.—The proper preparation of the paper depends on the kind used. It must be thoroughly damp and spongy, but must not have free moisture on it when it comes into contact with the inked plate. Suggestions regarding various papers have already been made in connection with the discussion of materials.

If you use ordinary hand-made paper or Japanese vellum, soak it in plenty of water over night, or better still for twenty-four hours. If the soaking is done in a tray with a comparatively small amount of water, the sheets should be put through fresh water before pressing. Then lay them alternately between large dry blotters, cut to uniform size, and leave them under pressure for an hour or so before using. A copying press, the bed of the etching press, or a drawing board, laid on top of the pile, with any suitable weight on it, will answer the

purpose. The undesirable excess of sizing will be dissolved away in the soaking, and the surplus moisture will be absorbed by the blotters, leaving the paper in the right condition for printing.

Another way, when it is not necessary to get rid of sizing, is to lay the dry sheets alternately between wet blotters, and leave them under pressure over night.

Soft, thin, and old papers should be dampened in this manner, as they are too tender to stand much handling when wet. Too much water should not be allowed to get into them at any time.

You can also soak half the number of sheets you expect to use, for a few minutes, and pile them alternately with the dry sheets. After they have been under pressure over night, or longer, the moisture will have permeated the whole mass. Heavily sized papers cannot be very well handled in this way, as the sizing sometimes causes trouble when the damp sheets are packed together. It will generally cause Japanese vellum to stick to the surface of the plate slightly when the proof is pulled, portions of it coming off.

Paper should not be left damp too long, as it will be affected by mildew in three or four days under pressure, especially in a warm room.

Your method of dampening must depend upon the way you wish to treat the sizing. Soaking and washing, in warm water if necessary, will dissolve a great deal

more of it than will come away if the wet blotters are used.

The surfaces of some papers should be slightly roughened with a stiff brush before dampening, to enable them to take the ink more readily. This adds richness to the proof, but it is better to use paper that does not require it. There is a great distinction between a shine produced by a surface size, and the rich sparkling effect of a good warm-toned texture. A shining surface on a finished proof is objectionable. The hand-made papers seldom have an objectionable finish. The lustre on Japanese vellum is modified by soaking, but the silky quality of the fibre, after the excess of size is gone, imparts a peculiar and usually desirable luminosity to the impression.

Japanese vellum usually has more lustre on one side than on the other. The difference can be seen by holding the damp sheet so that the light will reflect across the surface toward the eye.

You need not use your fine papers for working proofs, except in special cases, when you wish to ascertain the printing possibilities of the plate. Ordinary cheap plate paper or a white blotter will answer. The backs of spoiled vellum proofs, and there will be many of them, are very convenient for this purpose. Prepare them as you would fresh paper.

Always handle paper by the edges. In handling clean paper with inky fingers you can use small pieces

of strong paper, folded once. The sheets can be easily picked up and laid over the plate with them.

Do not uncover and expose the damp paper to the air until you are ready to lay it over the plate.

Any unused damp paper, including blotters, should be hung upon the wires with wooden clips, after you have finished printing for the day.

The process.—First see that the plate is clean and in perfect condition. Lay it on the plate warmer and heat it enough to melt the oil in the ink. It should not be hot enough to prevent you from holding it in your hand. Apply the ink with a dabber or a roller. If you use a dabber be careful not to rub the surface of the plate with it. Dab the ink on with direct pressure, with a rocking movement, until you have obtained a fairly even distribution. You will find the roller more convenient, and the application of the ink with it is quite as effective.

After the ink is on the plate rub it well into the lines with your fingers, or with a small wad of rag, for the first proof. After the lines have been once thoroughly filled, the work of the rag, in removing the surplus ink from the plate, for succeeding impressions, will insure the proper filling of the lines.

Remove the plate to a table, or other surface on which you are working. Fold up a good-sized pad of mosquito netting, and, with slow side movements and

Natural and Artificial Printing
From Etchings by the Author



NATURAL PROOF - PLATE WIPED CLEAN

Barley



SAME SUBJECT ARTIFICIALLY PRINTED

Barley



NATURAL PROOF - PLATE WIPED CLEAN

Barley



SAME SUBJECT ARTIFICIALLY PRINTED

Barley

moderate pressure, carefully wipe the most of the ink from the surface. When the copper begins to show, with another and cleaner piece of netting, or a cleaner part of the piece you are using, wipe away more ink, until the plate is fairly clean. Then with a still cleaner piece of netting, wipe away as much of the ink still adhering to the surface as you may wish to remove. Cheese-cloth or soft muslin can be used in wiping if desired, but the netting is better. This is called a "rag wipe." If you should treat the plate with the rag differently on various parts of the surface, obtaining some particular distribution of tints, and *retroussage* it, you would to that extent be using "artificial printing."

After wiping the plate nearly clean with the netting, you can continue the wiping with the side of the palm of your hand, charged with ink and whiting, until the surface is perfectly clean. If an impression is made at this point, it will be a "natural proof." This is called a "hand wipe," and would still be such if, instead of removing all of the ink, you had left a tint on the surface with your hand, instead of cleaning it completely. The plate can be *retroussaged* at this stage, and this operation, with the hand tint left in wiping, would be "artificial printing."

Having wiped the plate and applied to its surface the treatment which you have selected for it, wipe the edges clean and lay it on the plate warmer just long enough to heat it slightly. It should be warm enough to soften

the ink on it, but not warm enough to expel moisture from the damp paper which will be placed in contact with it. Put a thin, clean sheet of paper on the bed of the press, and lay the warm plate face upward on it. Then lay a sheet of the damp paper on the plate. Put a fine soft felt blanket, or a clean white blotter, over the paper, and on top of this lay a felt blanket of medium texture. Lay a coarser and stronger blanket over the rest of the padding, and the plate is ready to go under the roller.

Turn the handles of the press slowly and steadily, until you feel the roller begin to leave the edge of the plate nearest to you. At this point you can reverse the movement of the bed and bring it back, if you wish to subject the plate to two pressures of the roller. If you wait until the roller leaves the plate entirely, before reversing, you are more likely to have double lines in your proof. The roller may move the paper slightly in remounting the plate. With some papers it is practically impossible to go through and back without getting double lines. It is more easily done with very soft paper when the lines are quite deep. When it is possible to do it safely, the second application of the pressure insures a stronger impression, but with the slightest indication of any movement of the paper, confine the work of the roller to one pressure.

The handles are turned slowly to give the paper time to settle into the lines under the compensated pressure

through the blankets. A better adherence of the ink is obtained than if the bed was passed under the roller quickly.

Pressure.—The pressure used must be uniform all over the plate. Inequalities in it, on one side or the other, will cause the paper to pull and act badly. Many printers use entirely too much pressure. Only a moderate amount is needed. You should be able to turn the handles without exerting any great amount of strength, and at the same time be able to get a perfect mould of the plate with the damp paper. You can test the pressure with the plate and its accessories, before inking it, and the impression of the naked lines, and the edges of the plate, will indicate any regulation that may be necessary.

After the roller has passed over the inked plate, remove the blankets. Take hold of one corner of the paper, and lift it slowly and carefully from the plate. This is a solemn moment. Joy or sorrow, and possibly both, will be found on the other side of that sheet of damp paper, but, forgetting that for a minute, continue the lifting, gently, until the impression leaves the plate.

Its destiny may be a national gallery or a waste basket, but now that you have it off the press, you must care for it tenderly, as you would for the newly born.

When you have finished printing, the plate must be carefully cleaned, as any traces of ink left in the lines

will be difficult to remove if left to dry. The lines should be thoroughly gone over with a stiff brush and kerosene, wiped with a soft rag, and again rubbed with kerosene. Ground the plate when you put it away, to protect it from oxidization.

Clean the ink roller and slab with turpentine and rags. Wipe the press with oiled rags, and cover it to protect it from dust. Burn the oil- and ink-soaked rags.

Care of the impressions.—When the damp impressions are taken from the press, they should be laid on a flat surface until the paper is dry enough to handle. Then hang them, back to back, on the wires with clips, where they should be allowed to remain for several days. The inked lines which are embossed on the paper, must be thoroughly dry and hard before they are subjected to any pressure in the final drying process, otherwise they will be crushed down on the paper, and their beauty to a great extent destroyed.

An etching, we may say here, should always be looked at with a side light, as the shadows among the lines enhance the effect.

When the ink is well dried, soak the impressions in water until they are perfectly limp, and pile them alternately with dry blotters. Leave them under pressure, possibly twenty pounds, for an hour or so, and change the blotters. Hang the wet blotters on the wires to dry.

The next change can be made in three or four hours, and the next one in about twelve hours. The drying should be completed within twenty-four or forty-eight hours, as it is not well to allow moisture to remain in the paper too long. It will be likely to mould during warm weather or in a warm room.

There are several practical methods of drying the impressions, but the foregoing is the best, and leaves them in perfect condition.

When you have only a few proofs you can dry them conveniently in another way. Just after the impression comes from the press, and is still very damp, put it on a drawing board, and see that it lies quite flat and even. Take some strips of gummed or glued paper, an inch or so wide, the kind sold in rolls for fastening up paper packages, dampen them, and lay them along on the edges of the paper. Half of the width of the strip should be on the paper and the other half on the board. Secure it firmly to both the paper and the board. If the edges are completely secured, the paper will stretch perfectly smooth and flat in drying. The dry impressions can be removed from the board with the blade of a knife, inserted under the edges of the paper through the strips, and afterwards trimmed.

An impression which has been rough dried can be soaked and treated in the same manner. The surplus moisture should be removed with blotters before mounting on the board.

It is sometimes necessary to make corrections on the paper. A bare portion of a line, or a slightly broken tint, can be delicately worked over with a carbon pencil. Do not use a lead pencil as the graphite will shine. If the ink on the impression is not quite black, a fine water-colour brush, with colour matching the ink, can be used. Only a limited amount of work of this kind is allowable, and it must not be apparent. It should not be attempted until the ink is dry.

Dry impressions, on ordinary hand-made paper, can be treated with a rubber, when it is desirable to lighten a tint locally, but it must be done in a way that will not roughen the surface of the paper. A soft kneaded rubber, worked into the right shape, will do it. "Artists' gum," or a small compressed piece of fresh bread is also useful, and sometimes even a rather hard rubber can be used, which you can cut into convenient shape with a sharp knife. Accidental ink marks on the paper can be handled in the same manner.

Considerable skill is required to make any kind of an erasure on Japanese vellum. If a rubber is used, it will simply produce a little mass of disturbed fibre, which will get worse with continued friction.

Loosen up the affected spot slightly with a rubber, or the small blade of a penknife. Lay the paper over the back of a thin book, so that the surface will recede from each side of the spot. The little furry mass can then be shaved off with a razor. If properly done,

scarcely any trace of the operation will be visible. Sometimes the razor will be more effective without previous roughening of the spot. This can only be done on dry paper.

A vellum impression frequently comes from the press with parts of some of the lines merely embossed. The ink has not adhered to them, generally owing to the fact that the pressure of the roller, or the thickness of the blankets, has not been sufficient for the deeper lines. Vellum acts queerly sometimes, and even when the cause of the trouble is apparently located, the uninked surfaces may still appear. Insufficient or excessive moisture will also cause this trouble.

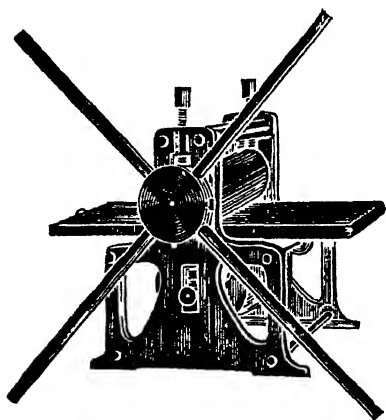
To a limited extent these faults can be corrected, while the ink is still fresh, with a small stiff brush. Carefully rub a little of the surrounding ink over on to the bare places. Light delicate work with a burnisher will sometimes be better, but care must be taken not to depress the raised line. It should be gone over afterwards with the brush, or the surface will be likely to shine when the ink is dry.

The finished impressions should be laid away, perfectly dry, under a moderate pressure, to keep them in good condition. An occasional airing is necessary. If they are properly matted they will be much safer.

Never roll an etching under any circumstances.

Impressions from an uncompleted plate are called working proofs, trial proofs, or proofs of a particular

state. A signed etching is a proof. Unsigned commercial impressions are prints. The terms are often misused. To call a proof a print is not good taste. A print may be any kind of an impression, from anything that will leave ink, or any other coloured medium, on paper, or any other suitable material.



CONCLUSION

Be extremely cautious as to the extent to which you allow yourself to be affected by criticism of your work, whether it be favourable or unfavourable. Indiscriminate praise and indiscriminate condemnation are equally worthless.

Criticisms and suggestions relating to materials and methods should always be welcomed. Their value is easily tested.

Beyond the questions of good or bad drawing and composition, the measure of your artistic success will be taken by the many, and not by the few who are educated in art.

You will come in contact with all sorts of opinions, and all sorts of people whose ideas, or the lack of them, will be expressed with a diversity of motives. To estimate the value of criticism, whether favourable or unfavourable, it is necessary to have a fuller knowledge of the qualifications and influences behind it than is usually possible. You will ordinarily be safe in allowing yourself to be influenced by the separately expressed opinions of several critics whom you consider competent and unbiased, if their criticisms agree.

The judgment of one who has no special art knowledge, but whose mind is otherwise cultivated, is often of great value. It is from many such minds that you will learn whether or not the story you have told or the song you have sung with your medium has adequately expressed your thought. You will not learn this from a jealous rival or from envious mediocrity around you.

The proper mental equipment of an artist includes many gifts besides the ability to draw. The mastery of a medium does not imply a mastery of its power. A man who can accurately draw the things he sees is not necessarily an artist, but simply more or less of a skilled draughtsman. One who can, by means of his drawing, or other art medium, convey thought and feeling, is an artist, and he can afford to be equally oblivious of ignorant praise and malicious censure.

In taking up the art of etching you will find yourself in a rare company. Its lore is filled with names and achievements of which the world of art is proud. You should familiarize yourself with the history of the art, and the work of those who have adorned its pages. Study the work of the great etchers in connection with the literature relating to them, but do not allow any one of them to have a predominating influence over you. The shadow of a great name is a formidable barrier to artistic success.

If you have a message of your own you will command attention. If you repeat a story that has been told, you

will not be listened to. The men who have left the great etchings in the world fearlessly created their own ideals. Do not try to follow them. Imitate their initiative and their courage, but not their work.

While Rembrandt was not the first etcher, he was the greatest of the early workers. His towering figure seems to enlarge instead of diminish in the perspective of the receding years. He was one of those geniuses who come forth at infrequent intervals, in the march of the centuries, and expand the known powers of mankind. We are accustomed unconsciously to regard him as symbolizing the beginning of the art of etching. Since his brilliant light came into the art world the processes used in the virile and graceful form of expression, to which he gave such a mighty impetus, have been left unchanged in general principle. The masters of etching, who have come after him, have devised and used many variations and improvements on his supposed mechanical methods. There has been an increase in the number and variety of the materials used, and many valuable accessories and auxiliaries have been introduced. Improvements in the manufacture of plates, paper, and inks have eliminated many of the uncertainties which must have haunted the earlier etchers. The ingenuity of the skilled mechanic and the chemist, as well as the discoveries of numerous amateur and professional workers, have added valuable materials to the modern etcher's atelier, which have greatly extended his facilities.

None of the statements, or expressions of opinion, in this treatise are intended to be arbitrary or dogmatic. The author's only hope is that you will find the book a substantial help and a pleasant companion in your work.

